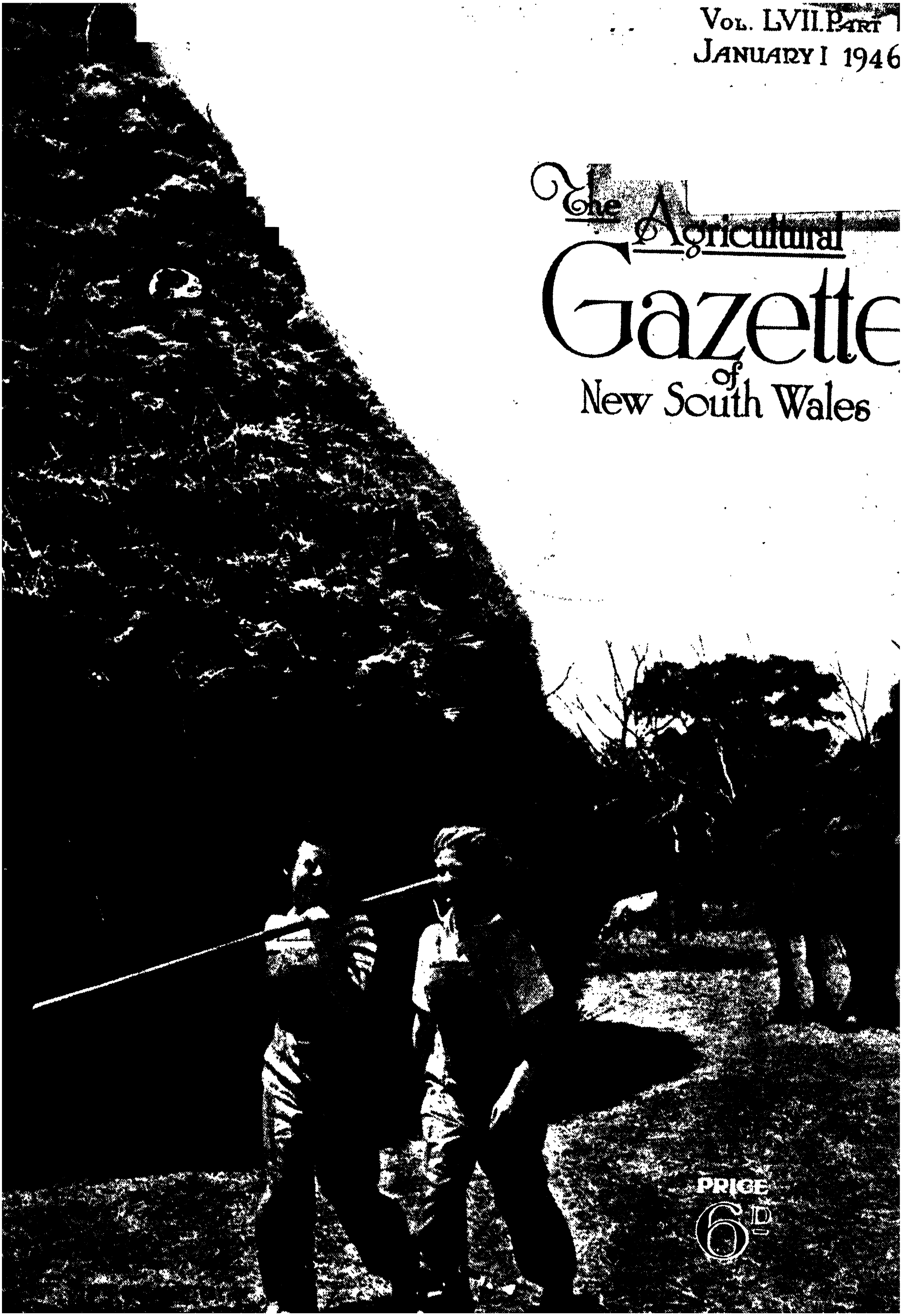
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AGRICULTURAL GAZETTE

. . OF . .

NEW SOUTH WALES.

Issued by direction of

The Hon. E. H. GRAHAM, M.L.A.

MINISTER FOR AGRICULTURE.

K. SYNNOTT, *Editor.*

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THE AGRICULTURAL GAZETTE FOR JANUARY, 1946.

This Issue Contains:—

New Year Greetings—

From the Minister for Agriculture.

I AM glad to extend to the primary producers of the State, through the Agricultural Gazette, my sincere wish that the year 1946 will prove a successful and happy one—a season of ample rainfall and one in which returns will provide the producer with a reward commensurate with his efforts.

With the difficult task of war years behind them, the farmers and graziers of Australia still find that there is need for the products of their industry to feed the people of Britain and other lands desperately short of food, and that they must sell these products under the difficult conditions imposed by a world endeavouring to re-establish peace, and with the market position still obscure. A great responsibility rests on them, for on their achievements depend not only their own success or failure, but also the prosperity of our State and Commonwealth.

In the past the returns to the producers have suffered, not only as a result of endeavouring to produce under unsound economic conditions, but also because of unwise land use and methods of animal husbandry, and of failure to provide for the inevitable poor seasons.

It is for us to remove these obstacles to a prosperous, happy and contented rural population, by fostering the adoption of a policy of conservation of our natural assets, and of co-operation in developing our agricultural and pastoral industries.

I am proud to be entrusted with the administration of the Department of State directly concerned with this task of building up our agriculture and to take my place in a Government which is making a practical approach to the solution of the great problems which must be faced. This Government has already made distinct contributions—such as the Farm Mechanisation and Fodder Conservation Schemes and the progress made towards the establishment of country killing—to the material well-being of the men on the land in this State, and I can assure you, that any service which it is in my power personally, or through the expert services of the technical officers of my Department, to render to you in your industry, is always readily at your disposal.

EH Graham

Temporary Pastures in the Wheat Rotation

A Means of Increasing Animal Products.

J. N. WHITTET, H.D.A., Chief Agrostologist.

THE demand for increased quantities of animal products of all descriptions means that greater calls will be made on pasture and crop areas, and consequently, in addition to conducting good pasture management practices, an endeavour must be made to establish additional areas of sown pastures and grazing lucerne.

One major difficulty to contend with in this work is the fact that superphosphate, an essential in pasture establishment operations, is at present in short supply for use in inland farming and grazing areas, and the only alternative to sowing pastures and lucerne the most effective way, that is on well-worked fallows with 1 cwt. superphosphate per acre, will be to plant such species as Wimmera Rye, lucerne, and some of the clovers on at least a proportion of the wheat area to be sown next autumn, as under these conditions the grass and clover seedlings will have access to some fertilizer.

The seeding rate for wheat under these conditions should not exceed 45 lb. per acre (on soils which produce a rank growth use only 30 lb. per acre) in order to give the pasture plants a chance to become established and not be unduly crowded by the rapid growing cereal.

Should the spring be dry, the young pasture plants are likely to suffer, because the more robust rooting systems of the cereal plants will unfavourably compete with those of the pasture plants for soil moisture.

Where pasture seeding with a cereal is to be carried out, wheat is preferred to oats, as the latter crop crowds the pasture seedlings more than wheat plants do.

The recommendations of pasture mixtures for the various wheat zones—as set out in the recommendations of wheat varieties on page 7, and shown in the map which accompanies that article—are as follows:—

Pasture Recommendation.

Wheat Zone No. 1.

Sow a mixture of Italian Rye 10 lb. and Red clover 4 lb. seed per acre; on heavy basaltic flats, add 2 lb. Black Medic (*Medicago lupulina*) seed to the mixture.

Wheat Zone No. 5.

Sow Wimmera Rye 1 lb., lucerne 2 lb., Subterranean clover (mid-season strain) 2 lb., Ball clover 1 lb., Barrel clover 1 lb., and Burr trefoil 1 lb. per acre on soils of good depth; where soils are shallow, omit the lucerne from the mixture and increase the Wimmera Rye to 3 lb. and the Ball and Barrel clovers and Burr trefoil to 2 lb. of each per acre.

Wheat Zone No. 13.

In the higher rainfall sections of this area Italian Rye 10 lb. and Red clover 4 lb. is a satisfactory mixture for a short term pasture of two years. Where a hardier mixture is required, plant Wimmera Rye 2 lb., Subterranean clover (mid-season strain) 3 lb., Ball clover 2 lb. per acre; on deep, well-drained soils add 1 lb. of lucerne seed to this mixture.

Wheat Zones Nos. 2, 3, 4, 6, 9, 10, 11, and 12.

Where soils are friable and deep use a mixture of Wimmera Rye 1 lb., lucerne 2 lb. and Burr trefoil 2 lb. per acre; on the heavier types of country, unsuitable for lucerne, sow Wimmera Rye 3 lb. and Burr trefoil 4 lb. per acre. The lower rainfall sections of Zone No. 12 are too dry for lucerne and there the Wimmera Rye-Burr trefoil mixture should be planted.

Wheat Zones Nos. 7 and 14.

Plant Wimmera Rye 1 lb., lucerne 2 lb., Subterranean clover (mid-season strain) 2 lb. where soils are of good depth; on shallower country, use Wimmera Rye 3 lb. and Subterranean clover (mid-season strain) 3 lb. per acre.

Wheat Zones Nos. 8, 17 and 18.

In Zones Nos. 8 and 17 and the good rainfall sections of Zone No. 18, sow similar mixtures to those given for Zone No. 6; use Subterranean clover (early strain) 1 lb., and Barrel clover 1 lb., instead of Subterranean clover (mid-season strain), in the lower rainfall parts of Zones Nos. 17 and 18.

Wheat Zones Nos. 15, 19 and the Eastern half of Zone No. 20.

Use Wimmera Rye 1 lb., lucerne 2 lb., Subterranean clover (early strain) 2 lb., Ball clover 1 lb. and Barrel clover 1 lb. per acre on deep soils. In the case of shallow soils omit the lucerne and increase the Ball and Barrel clover seedings to 2 lb. each.

Wheat Zone No. 16 and the Western half of Zone No. 20.

Plant Wimmera Rye 1 lb., lucerne 2 lb., Ball clover 1 lb., Barrel clover 1 lb., Burr trefoil 1 lb. per acre on deep soils; for soils of poor depth use a mixture per acre of Wimmera Rye 3 lb., Ball and Barrel clovers and Burr trefoil 2 lb. of each. The lower rainfall sections of Zone No. 20 are too dry for lucerne.

Wheat Zones Nos. 21 and 22.

In these Zones sow Wimmera Rye 3 lb., and Burr trefoil 3 lb. per acre.

Irrigated Areas. (A superphosphate ration is available for establishing pastures under irrigation.)

The most satisfactory method of establishing pastures on irrigated country is to sow the grass

(*Continued on page* 46.)

FOUR NEW RECOMMENDED WHEATS

WHICH COMBINE

STEM RUST RESISTANCE

with

YIELD AND QUALITY.

THE outstanding feature of this year's recommendation of varieties of wheat for sowing in the various wheat zones of the State (see page 7) is the inclusion of four new varieties —Gabo, Kendee, Yalta and Celebration. These varieties possess the character of stem rust resistance combined with high yielding capacity and moderate to high baking quality grain. They have been developed to serve particularly the North-western districts of New South Wales, and interested parties are advised to accept them as being worthy of trial within commercial crop areas under certain conditions and within defined zones. It may be that further tests will prove them to be suited to a wider range of the wheat districts of New South Wales, and should this be so, appropriate recommendations will subsequently be made.

The varieties are described and illustrated in this article. Gabo and Kendee are productions of the work of Dr. W. L. Waterhouse and Dr. I. A. Watson, of the University of Sydney, in co-operation with several north-western wheat-growers, and the varieties Yalta and Celebration have resulted from the work of Dr. S. L. Macindoe and his co-workers of the New South Wales Department of Agriculture in co-operation with the North-western Plant Breeders' Association, Tamworth, and also several north-western wheat-growers.

GABO.

(Bobin selection x Gaza x Bobin selection.)

Recommended for late planting, and not prior to early June, within the North-western districts of New South Wales—Zones 2, 3, and 4. It is highly resistant to the known races of stem rust, and also to leaf rust; moderately susceptible to flag smut. The straw is short and of satisfactory strength; the ear is white, compact, of moderate length, and although the crop threshes readily, the grain is held in the ripe ear satisfactorily and is not predisposed to shattering.

The stooling capacity is good, being above the average of the quick-maturing varieties; the ear has the characteristic of developing three grains wide; the yielding capacity is high.

The grain is of moderate size, deeply creased and is lacking in a smooth plump finish. The flour quality is of the medium strong class.

Seed of Gabo is in keen demand and its area increase within the next few years may be spectacular, and particularly so within the earlier sections of the North-west. Farmers are reminded that its earliness outclasses it as a main crop variety, except perhaps within the early sections, and that elsewhere it should not be sown prior to early June. Any earlier plantings will tend to promote over rank growth which may be liable to stem and ear frost damage. The moderate flag smut susceptibility is not likely to be a serious weakness in such a late sown variety.

KENDEE.

(Dundee x Kenya (U.A. No. 745).)

Recommended for late mid-season planting and not prior to the second week of May within the North-western districts of New South Wales—Zones 2, 3 and 4. It is highly resistant to the prevalent races of stem rust, but is leaf rust susceptible to the same degree as most of the commercial varieties; resistant to flag smut. The straw is of moderate height, and of satisfactory strength; the ear is white, compact, of moderate length, and although the crop threshes readily the grain is held in the ripe ear satisfactorily and is not predisposed to shattering.

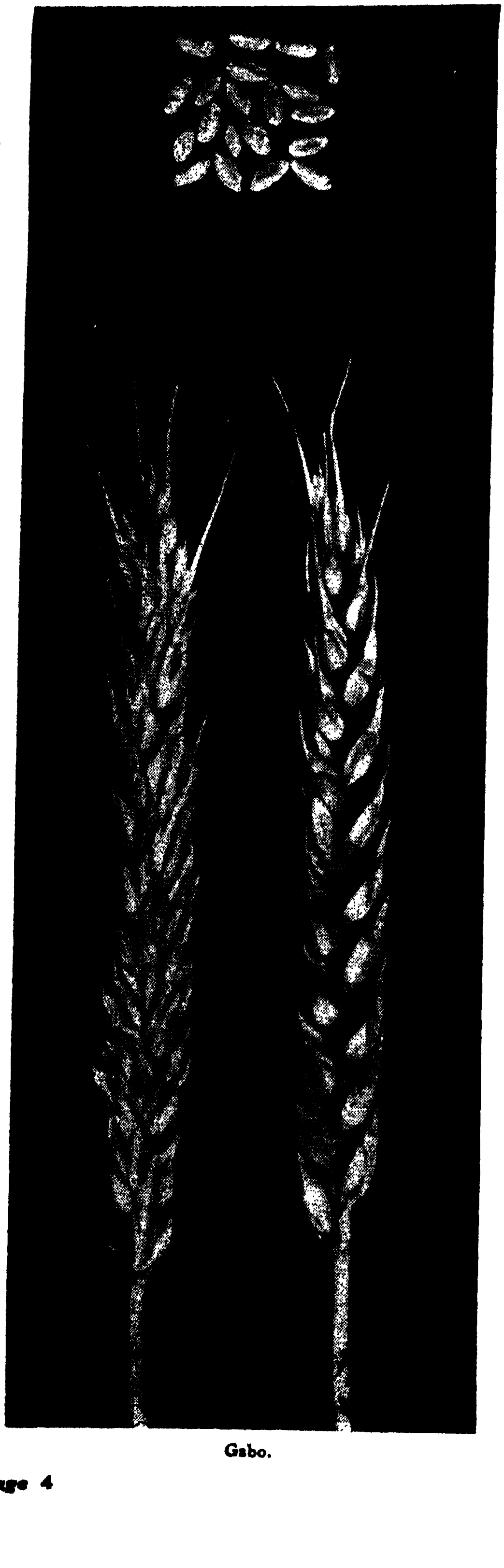
The stooling capacity is good; the ear has the characteristic of developing three grains wide; and the yielding capacity is high. The grain is of moderate size and moderately deeply creased, and is lacking in a smooth plump finish. The flour quality is of the medium strong class.

Kendee is little later in maturity—approximately two weeks than Gabo. It will more nearly approach a main crop variety for the early locations and is suitable for moderately late plantings within the three north-western zones. Its freedom from flag smut and its slightly better grain finish than that of Gabo are advantages.

YALTA.

(Kenya x Pusa 4 x Dundee.)

Recommended for mid-season planting and not prior to the first week of May within the North-western districts of New South Wales—Zones 1, 2, 3 and 4. It is a main crop variety; highly resistant though not immune to the prevalent races of stem rust; it is leaf rust susceptible to the same degree as most of the commercial varieties; it is highly resistant though not immune to flag smut. The straw is of moderate height and of



Gabo.

Kendee.

Yalta.

Celebration.

satisfactory strength. The ear is creamy, of moderate length, compact and squarish; the chaff is pubescent (short hairs), and although the crop threshes readily, the grain is held in the ripe ear satisfactorily and is not predisposed to shattering.

The stooling capacity is good; the ear has a tendency to develop two grains wide, but under favourable conditions the development of three grains wide may be expected. The yielding capacity is moderately high within the main crop group of varieties.

The grain is moderately small, of shallow crease; plump, vitreous, of amber colour; the bushel weight is high. The flour quality is of the strong class and approaches the Pusa varieties with respect to gluten quality.

As a main crop variety, Yalta is an outstanding production suited to the north-western districts. It has disease resistance, desirable field characters, moderately high yielding capacity, and premium quality grain. It may be recommended to replace the Eureka varieties.

CELEBRATION.

*** (Double cross x Dundee x Dundee.)**

Recommended for early planting (April-early May) within the North-western districts of New South Wales—Zones 1, 2, 3 and 4. It is highly resistant to flag smut; it is a main crop variety highly resistant to the prevalent races of stem rust. The straw is tall and of satisfactory strength, and in these respects is similar to Ford. The ear is moderately long, tapering, smooth, and light-brown in colour. The crop threshes easily, but the grain appears to be held rather loosely in the ripe ear, and further observations are required under varying seasonal conditions to determine whether the variety is predisposed to shattering.

The stooling capacity is good; the ear has a tendency to develop two grains wide, but under favourable conditions the development of three grains wide may be expected. The yielding capacity is high within the main crop group of late maturing varieties. The grain is moderately long, moderately plump and is frequently vitreous and of amber colour. The flour quality comes within the medium strong class, and is somewhat superior to Ford in gluten content.

Celebration as a late-maturing, early planted variety has possibilities in replacing Ford within stem rust-liable zones. Farmers are advised to introduce it with reservations, as Ford has proved to be an all round useful variety over a wide area of the State and under varying conditions.

* The double cross parent is a sister line to the American variety Thatcher (Marquis x Kanred x Marquis x Iumillo).

Traineeships in Agriculture and Veterinary Science.

APPLICATIONS are invited by the Public Service Board for the undermentioned traineeships in the Departments indicated, but *applications will not be accepted until after the Leaving Certificate results* have been announced in January, 1946:—

Agricultural Trainees.—Departments of Agriculture and Conservation.

Veterinary Trainees.—Department of Agriculture.

Applicants must hold the Leaving Certificate or the Hawkesbury Diploma in Agriculture, and be qualified for admission to the University as matriculated students in the Faculties or Departments to which the traineeships apply.

On Wednesday, 6th February, 1946, the applicants whose qualifications are deemed to merit further consideration will be required to write an essay, of not more than 2,000 words, on the subject:—"Is Australia's Future Likely to be Dependent upon Primary Industries or the Development of Secondary Industries?"

Appointees must be prepared to enter into a bond with two sureties in the sum of £500 to pursue to completion their courses of training leading to the award of the appropriate Degree or Diploma and continue in the Public Service for a period of five years thereafter.

All trainees (male and female) will be paid an allowance of £110 p.a. (w.e.) during training, and University, etc., fees will be met by the Government. During University vacations all trainees will be given field, laboratory and office practice, but they will be allowed three weeks per annum recreation leave. They will be paid expenses incurred by undertaking vacation training.

On satisfactory completion of training they will be employed on appropriate work and paid in accordance with the award or agreement applicable to the position.

Preference will be given to those who can show, by their previous examination results or otherwise, an aptitude for these studies. Applications will not be accepted from candidates over 21 years of age, unless they are ex-servicemen, in which case the age limit has been extended to 25 years.

Applications should be submitted on a form (No. 61) obtainable at the office of the Board or at the Government Printing Office, and should be forwarded direct by the applicant to the Secretary in time to reach him not later than 23rd January, 1946.

The filling of the position will be notified in the Public Service supplement to the Government Gazette.

VARIETIES OF WHEAT RECOMMENDED For 1946 Sowing.

IN recommending to growers the varieties they should sow in 1946, the Department directs particular attention to four new varieties which possess the characters of stem rust resistance, moderate to high flour quality and high yielding capacity, included in the list for the first time this season. The varieties—Gabo, Kendee, Yalta and Celebration—are the result of work of the University of Sydney and the Department of Agriculture, and the initial recommendation is for commercial growing within the North-western Districts of New South Wales, and widespread trials in small areas within the Central and Southern wheat areas.

WHEAT varieties which are classified as stem rust resistant have proved to be resistant under field conditions to the races of stem rusts which are known to be present in New South Wales. It should be understood that no authority is in a position to guarantee that varieties will maintain the character of stem rust resistance should new races of stem rust occur.

Descriptions and illustrations of these varieties are given in an article on page 3 of this issue.

Unless otherwise mentioned the varieties of wheat recommended are suitable for both grain and hay. The accompanying map shows the wheat zones.

Varieties are classed as suitable for "Early Sowing", "Mid-season Sowing" and "Late Sowing" in relation to the normal range of sowing dates for the district. Wheats suitable for early sowing are usually late maturing, and if sown late they may be prematurely hayed off by excessive heat and may also be more liable to destruction by rust. On the other hand, early maturing varieties suitable for "Late Sowing" may, if sown early, come into head prematurely and be destroyed by frost or cold damage. Early maturing varieties should, therefore, *not* be sown early, nor should late maturing varieties be sown late. Within reasonable limits early sowings are likely to be more satisfactory in most districts than late plantings.

NORTHERN WHEAT BELT.

Zone 1: Northern Tableland.

(Armidale, Glen Innes.)

Mid-season Sowing—Ford, Celebration.

Late Sowing—Yalta.

Zone 2: North-western Slopes—Eastern Portion.

(Warialda, Delungra, Inverell, Bingara, Barraba, Attunga, Tamworth, Quirindi and Upper Hunter Districts.)

Early Sowing—Fedweb 1, Ford, Celebration, Bordan (for Upper Hunter).

Mid-season Sowing—Ford, Yalta, Kendee.

Late Sowing—Charter, Gular, Pusa 4, Pusa 111, Gabo.

Zone 3: North-western Slopes—Western Portion.

(Manilla, Somerton, Curlewis, Gunnedah, Boggabri, Mullaley, Tambar Springs.)

Early Sowing—Fedweb 1, Ford, Celebration.

Mid-season Sowing—Yalta, Kendee.

Late Sowing—Charter, Gular, Pusa 4, Pusa 111, Gabo.

Zone 4: North-western Plains.

(Boggabilla, Garah, Gravesend, Pallamallawa, Bellata, Narrabri, Baan Baa, Wee Waa, Pilliga, Baradine, Coonamble.)

Early Sowing—Ford, Fedweb 1 (in limited areas), Celebration.

Mid-season Sowing—Yalta, Kendee, Charter.

Late Sowing—Charter, Gular, Pusa 4, Pusa 111, Gabo, Bungulla (Baradine District).

CENTRAL WHEAT BELT.

Zone 5: Central Tableland.

(Bathurst to Orange Districts.)

Mid-season Sowing—Bordan, Ford, Waratah.

Late Sowing—Waratah.

Zone 6: Central-western Slopes—North-eastern Portion.

(Coonabarabran, Binnaway, Mendooran, Leadville, Coolah, Dunedoo, Gulgong, Mudgee, Wellington, Geurie.)

Early Sowing—Ford, Bordan.

Mid-season Sowing—Bencubbin, Baroota Wonder (for hay only), Eureka 2.

Late Sowing—Gular, Eureka, Bungulla.

Zone 7: Central-western Slopes—Central-eastern Portion.

(Molong, Manildra, Cumnock, Cudal, Cargo.)

Early Sowing—Bordan, Ford.

Mid-season Sowing—Waratah, Bencubbin.

Zone 8: Central-western Slopes—South-eastern Portion.

(Cowra, Canowindra, Eugowra, Goolagong, Koorawatha, Greenethorpe, Grenfell.)

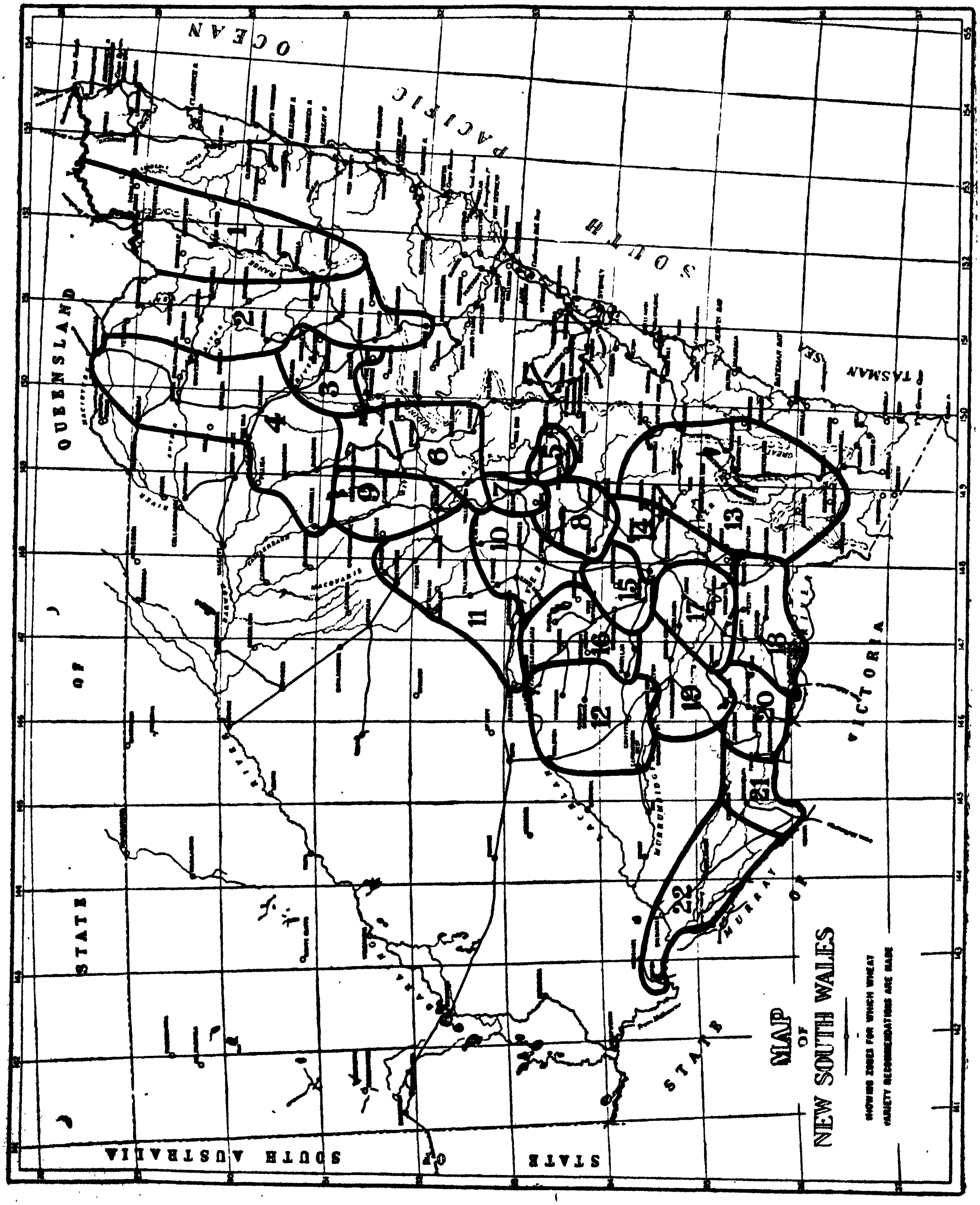
Early Sowing—Bordan, Ford.

Mid-season Sowing—Dundee (for grain only), Waratah, Bencubbin, Koala.

Zone 9: Central-western Slopes—North-western Portion.

(Tooraweenah, Gulargambone, Gilgandra, Eumungerie, Dubbo, Wongarbon, Tomingley.)

Early Sowing—Ford.


MAP OF NEW SOUTH WALES
SHOWING ZONES FOR WHICH WHEAT VARIETY RECOMMENDATIONS ARE MADE
SOUTH PACIFIC OCEAN
TASMAN SEA
STATE OF QUEENSLAND
STATE OF SOUTH AUSTRALIA
STATE OF VICTORIA
1
2
3
4
5
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7
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18
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20
21
22

Mid-season Sowing—Dundee (for grain only), Bencubbin.

Late Sowing—Gular.

Zone 10: Central-western Slopes—South-western Portion.

(Parkes, Forbes, Bogan Gate, Peak Hill, Trundle.)

Early Sowing—Ford.

Mid-season Sowing—Dundee (for grain only), Bencubbin, Baroota Wonder (for hay only).

Late Sowing—Gular, Koala, Baroota Wonder (hay only).

Zone 11: Central-western Plains—Northern Portion.

(Albert, Tottenham, Trangie, Narromine, Condobolin, Euabalong.)

Early Sowing—Bencubbin, Baroota Wonder (for hay only).

Mid-season Sowing—Gular, Koala.

Zone 12: Central-western Plains—Southern Portion.

(Cargelligo, Tullibigeal, Hillston, Merriwagga, Weethalle, Rankin's Springs, Yenda, Griffith.)

Early Sowing—Bencubbin.

Mid-season Sowing—Gular, Bungulla.

SOUTHERN WHEAT BELT.

Zone 13: Southern Tableland.

(Goulburn, Yass, Federal Territory.)

Mid-season Sowing—Ford, Waratah,

Zone 14: South-western Slopes—Eastern Portion.

(Young, Boorowa, Bendick Murrel, Murrumburrah, Wallendbeen, Cootamundra, Stockinbingal.)

Early Sowing—Bordan, Ford.

Mid-season Sowing—Waratah, Bencubbin.

Zone 15: South-western Slopes—Central Portion.

(Bribbaree, Quandialla, Caragabal, Temora, Ariah Park, Barmedman.)

Early Sowing—Bordan, Ford.

Mid-season Sowing—Dundee (for grain only), Bencubbin.

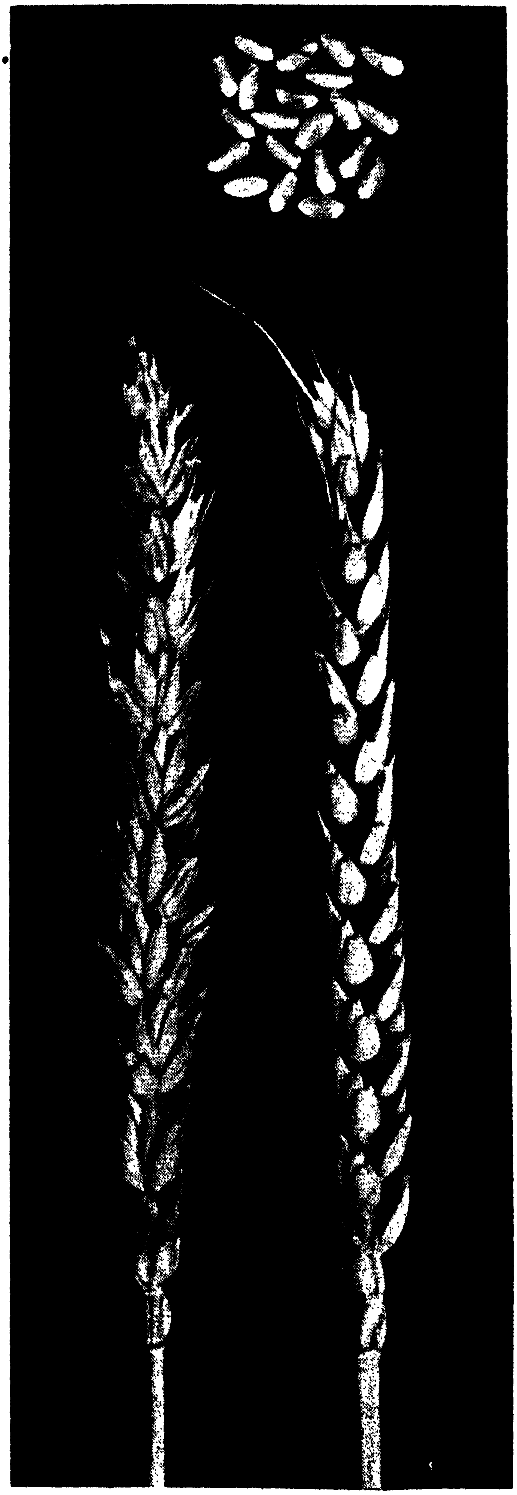
Zone 16: South-western Slopes—Western Portion.

(Wyalong, Ungarie, Barellan, Ardlethan, Tallimba.)

Early Sowing—Ford.

Mid-season Sowing—Dundee (for grain only), Bencubbin.

Late Sowing—Gular.



Charter Wheat.

Zone 17: North-eastern Riverina.
(Junee, Marrar, Coolamon, Wagga, Uranquinty, The Rock, Milbrulong, Lockhart.)

Early Sowing—Zealand (for hay only); Bordan, Ford.

Mid-season Sowing—Dundee (for grain only), Baroota Wonder (for hay only), Bencubbin.

Zone 18: South-eastern Riverina.
(Yerong Creek, Henty, Pleasant Hills, Culcairn, Holbrook, Walbundry, Walla Walla, Gerogery, Jindera, Albury, Tumbarumba, Brocklesby, Balldale, Corowa.)

Early Sowing—Bordan, Ford.

Mid-season Sowing—Dundee (for grain only), Bencubbin.

Late Sowing—Gular.

Zone 19: North-central Riverina.
(Ganmain, Grong Grong, Narrandera, Darlington Point, Boree Creek, Urana.)

Early Sowing—Ford.

Mid-season Sowing—Dundee (for grain only), Bencubbin.

Late Sowing—Gular.

Zone 20: South-central Riverina.
(Rand, Daysdale, Oaklands, Jerilderie, Berrigan, Finley, Tocumwal, Mulwala.)

Early Sowing—Ghurka (for grain only), Ford.

Mid-season Sowing—Ranee and Dundee (for grain only), Bencubbin.

Late Sowing—Gular.

Zone 21: Western Riverina.
(Deniliquin, Mathoura, Moama.)

Early Sowing—Ghurka (for grain only).

Mid-season Sowing—Ranee and Dundee (for grain only), Bencubbin.

Zone 22: Far Western Riverina.
(Moulamein, Balranald, Euston.)

Early Sowing—Ranee (for grain only), Bencubbin.

Zone 23: Murrumbidgee Irrigation Area (on irrigated areas).

Early Sowing—Bordan, Ford.

Mid-season Sowing—Waratah, Bencubbin.

Late Sowing—Waratah.

COASTAL DISTRICTS.

Early maturing varieties for hay or green fodder—Waratah, Florence.

Early Sowing only—Ford.

Notes on Recommended Wheat Varieties.

WITH the exception of the four new varieties included in the list of recommendations for the first time this season, which are described and illustrated on page 3 of this issue, the following descriptions relate to the varieties recommended for various districts and purposes. They are given as a guide to farmers in the choice of the best varieties of wheat for their conditions.

Order of Sowing.

Early sowing—Ford type of wheat.

Mid-season sowing—Bencubbin type of wheat.

Later sowing—Gular type of wheat.

Baroota Wonder.—Essentially a hay wheat of excellent quality and acre yield for mid-season and later sowings. Farmers are strongly urged to sow the headlands of paddocks (which are usually cut for hay) with this variety. The growth is moderately tall, with slender, heavy weighing stems which cure to a desirable green colour. The leaves are moderately sparse, and generally free of disease troubles. The variety is slightly resistant to flag smut, but is susceptible to stem rust.

Bencubbin.—A popular wheat of mid-season sowing, highly resistant to flag smut, and possessing only a moderate susceptibility to stem rust. On account of its tall growth and tendency to lodge, it should not be grown on over-rich soils or in districts of high rainfall, where Ford is a better variety. The grain bleaches fairly readily, and although classed as a weak flour wheat, it matures a bright grain of moderately good flour when grown within the lower rainfall districts. It is recommended for dry districts in place of Nabawa. The area sown to this variety has become excessively great, and its part replacement with medium strong varieties would ease some problems connected with flour blends and export shipments.

Bordan.—A variety lately recommended for early sowings within favoured rainfall districts. It is tall growing, moderately resistant to stem rust and flag smut, and the grain is of the medium strong flour class. In many respects Bordan resembles Ford, and is likely to replace it in districts of good rainfall, as it has a higher yielding capacity. It does not, however, finish quite as well should the late spring conditions be dry. As a hay wheat, it is not quite the equal of Ford in quality.

Charter.—Recommended for the first time in 1945 for the northern sections of the wheat belt. In maturity it falls between mid-season and early maturing wheats. It is highly resistant to stem rust and to flag smut and may be classed as a strong or "premium" wheat, the grain of which is frequently vitreous. Its straw is tall and somewhat Ford-like, so that Charter can scarcely be recommended for planting on heavy soils in preference to a strong-strawed wheat. Its straw is, at least not inferior to that of

GOLDEN FLEECE
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D6

Gular or of the recommended Pusas, with which it competes in late sowings. It may also replace some Bencubbin, the straw quality of which is decidedly inferior to that of Charter. It may prove to be a desirable early hay wheat.

Dundee.—A productive variety for mid-season sowing; moderately short strong straw; moderately resistant to flag smut but very susceptible to stem rust and susceptible to frost damage. It is classed as a medium strong flour wheat, and under suitable dry ripening conditions produces a vitreous grain, but it frequently produces a mottled grain. In view of the extreme susceptibility of Dundee to stem rust, it is considered that its cultivation should be reduced in areas where other wheats of approximately equal yielding ability are available.

Eureka.—A mid-season sowing wheat of medium height and strong straw. Susceptible to stem rust and moderately susceptible to flag smut. It is a high-yielding variety and produces a medium-strong flour of high quality.

Fedweb 1.—A short, strong straw variety suited to early sowings, particularly within the North-western portion of New South Wales. It is highly resistant to stem rust but susceptible to leaf rust, flag smut and Septoria. The grain, which is held firmly, is in the medium strong flour class and is of high quality.

Florence.—A wheat suited to late sowings, with tall tender straw. Moderately resistant to flag smut and to stem rust. Highly resistant to bunt. The grain is very subject to shedding. It is generally hard and vitreous, with medium strong flour. Recommended only for green fodder and hay in coastal districts.

Ford.—A variety suited to early sowings within favoured rainfall areas. It is tall growing, possessing straw which picks up and combs well, or makes into good hay of good colour and quality; it is moderately resistant to stem rust and flag smut, and the grain is of the medium strong flour class. Ford "finishes" better than most varieties even though the late spring may be dry, and the grain also appears to have a satisfactory resistance to bleaching. It is recommended for extensive sowings in all but the lower rainfall districts.

Ghurka.—A variety suited to early sowing within the Western Riverina, possessing very short strong straw. Resistant to flag smut and has some resistance to stem rust. Grain of weak flour strength.

Gular.—A wheat suitable for late sowing within favoured districts and for mid-season sowing within the drier districts. It is susceptible to flag smut and to stem rust. It is in the medium strong flour class. The grain is generally hard and vitreous, being but little inferior to Pusa 4 in baking quality, and therefore a high premium wheat.

Koala.—An early maturing, moderately short and strong-strawed wheat which is very attractive to the farmer in field characteristics. It is however, only moderately resistant to flag smut and susceptible to stem rust. It has an attractive grain which in bushel weight is superior to that of most other varieties. In baking quality it is certainly superior to Waratah which it is likely to replace to some extent.

Pusa 4.—A late sowing variety with slender straw. Somewhat resistant to flag smut. Susceptible to stem rust. Grain generally hard, and in the strong flour class. On account of its relatively light yield it is suitable only for a few localities in northern districts.

Pusa 111.—A smooth-chaffed selection from Pusa 4, to which it is similar in all other characters.

Rance.—A mid-season sowing wheat, with short, fine but strong straw. Susceptible to flag smut and to stem rust. A weak flour wheat.

Waratah.—A tall-growing variety suited to mid-season sowing. The straw is slender, but picks up and combs well should the crop become lodged. It is susceptible to flag smut. The grain is of the weak flour class. Ripe crops are liable to shed. Most of the area previously sown to Waratah is now sown to Bencubbin.

Zealand.—A variety suited to early sowing and which produces high yields of hay of excellent quality in favourable districts. It is highly resistant to flag smut, but susceptible to stem rust. The straw is very tall, but stands fairly well. It is recommended only for hay.

Oats as Feed for Pigs.

WITH oats available again for stock feeding, pig-farmers should be in the position of being able, if necessary, to use oats as part of their pig ration. On account of their relatively high fibre content (10 per cent. as against about 2 per cent. in wheat), oats are not satisfactory as the only grain for pigs, but half of the grain ration may be replaced by oats without materially affecting growth rates. As sows and boars are not actively growing, they can handle a bulkier ration than can growing stock, and more than 50 per cent. of oats may be included in the feed of these animals.

Where wheat is 4s. a bushel, oats is as good buying if not more than about 2s. 3d. per bushel, and with wheat at 3s. per bushel, oats is as good buying if not more than about 1s. 8d. per bushel.

The oat grain should be finely ground. Soaking or boiling is no substitute for breaking up the grain in this manner. In fact, soaking or boiling may even decrease digestibility of the whole grain.

As with wheat, mixtures of oats and other grains must be supplemented with protein. With the present shortage of meat meal this may present some difficulty. The pamphlet recently published by the Controller of Meat Supplies and obtainable from the New South Wales Department of Agriculture explains how the meat meal shortage can be overcome.

OATS AND BARLEY RECOMMENDATIONS

For 1946 Sowing.

ONE of the essentials to success in the growing of the winter cereals, oats and barley, is to sow varieties suited to the climatic and soil conditions.

The following are the recommendations of the Department of Agriculture for the 1946 sowing season for different districts and purposes:—

OATS.

North Coast.

For early green fodder—Sunrise, Buddah.

For grazing—Fulghum, Algerian.

South Coast.

For early green fodder—Belar, Sunrise, Mulga, Buddah.

For grazing—Algerian, Fulghum.

For late green fodder—Algerian.

Northern Tableland.

For grain, hay, or grazing (autumn sowing)—Algerian.

For grain or hay (autumn sowing)—Lampton.

For grazing only (autumn sowing)—Fulghum.

For grain or hay (spring sowing)—White Tartarian, Lampton.

Central Tableland.

For grain, hay, or grazing (autumn sowing)—Algerian.

For grain or hay (autumn sowing)—Lampton, Weston.

For grazing only (autumn sowing)—Fulghum.

For grain or hay (spring sowing)—White Tartarian, Lampton.

Southern Tableland.

For grain, hay, or grazing (autumn sowing)—Algerian.

For grain or hay (autumn sowing)—Lampton.

For grazing only (autumn sowing)—Fulghum.

For grain or hay in coldest parts (spring sowing)—White Tartarian, Lampton.

North-western Slopes and Upper Hunter.

For grain, hay or silage—Algerian, Belar, Burke, Mulga, Buddah.

For grazing—Algerian, Burke, Fulghum.

Central-western Slopes.

For grain, hay or silage—Algerian, Belar, Burke, Weston.

For grain, hay or silage in drier parts—Gidgee.

For grazing—Algerian, Burke, Fulghum.

South-western Slopes and Eastern Riverina.

For grain, hay or silage—Algerian, Belar, Burke.

For grazing—Algerian, Burke, Fulghum.

Western Plains and Western Riverina.

For grain, hay or silage—Belar, Burke, Gidgee, Mulga.

For grazing—Burke, Fulghum.

Murrumbidgee Irrigation Area.

For grain, hay or silage—Algerian, Belar, Burke.

For grazing—Algerian, Burke, Fulghum.

BARLEY.

Recommended Varieties.

The varieties of barley recommended by the Department are:—

Malting or two-row type—Pryor.

Feed or six-row type—Trabut (for green fodder or grain).

Effect of Lime on the Soil.

BY the application of lime, a soil is supplied with the element calcium, without which the great majority of plants cannot grow. The effect of liming is beneficial in the following ways:—

1. It neutralises or reduces soil acidity. This is perhaps the most important action of lime on soils, for, when excessive acidity has been removed, lime can exert other beneficial effects. (There is no foundation for the belief that exposure of acid soils to the atmosphere removes soil acidity. Soil acidity is caused by the removal of bases such as lime from the soil, and can be remedied or reduced only by the addition of liming materials.)

2. It improves the texture of heavy acid soils by causing the formation of a granular structure. Drainage goes on more readily, aeration is improved, and the soil is easier to work.

3. The removal or reduction of acidity encourages the growth of beneficial soil organisms, especially those which convert the nitrogen in soil organic matter into a form which can be used by plants.

A pamphlet on the subject of lime in relation to agriculture is obtainable free on application to the Division of Information and Extension Services, Department of Agricuture. Box 36A, G.P.O., Sydney.

The Geologic Sources Of the Commoner Chemical Elements.

Their Agricultural Significance.

(*Continued from page* 441.)

A. N. OLD, B.Sc.Agr., Analyst.

PHOSPHORUS.

THE element phosphorus has been described as "one of the most remarkable of the many remarkable substances known to the chemist." It is probable that Arabian alchemists had some knowledge of it as early as the twelfth century, though its discovery is usually credited to H. Brand, an alchemist of Hamburg, who, in 1669 accidentally produced it while searching for the Philosopher's Stone. Kunckel and also Boyle somewhat later prepared phosphorus more or less independently.

Much secrecy seems to have surrounded the new substance and Boyle's assistant, Hanckewitz, enjoyed a virtual monopoly of its manufacture and sale for many years, his customers including the European alchemists. It was not until about 1770 that the occurrence of phosphorus in bones was demonstrated, and it was left for Lavosier to prove that it was definitely a new element.

The Occurrence of Phosphorus.

In the ten mile crust of the earth (with oceans and atmosphere) phosphorus accounts for approximately .11 per cent. of the total mass, and occupies about thirteenth place in order of abundance of the elements. It does not occur in the free state in nature (except in some meteorites)—were it to be formed it would oxidise readily in contact with atmospheric oxygen.

When prepared in the laboratory, the white variety of phosphorus has to be kept under water to prevent oxidation. Slow oxidation of the white phosphorus under cold conditions is accompanied by the evo-

lution of light, hence the term phosphorescence.

The curious natural phenomena, known as Will-o'-the-wisps, Jack o' lanterns, or Elf-candles, consisting of flickering lights appearing over marshy areas, are due to the spontaneous ignition of gas bubbles containing phosphuretted hydrogen (PH_3), formed from decomposing organic matter.

Combined, chiefly as phosphate, phosphorus is one of the most evenly and widely distributed of the elements. Nearly all igneous rocks contain a small but significant proportion of the mineral *Apatite*, of which there are two types, chlor-apatite $3\ Ca_3\ (PO_4)_2$—$CaCl_2$ and fluor-apatite $3\ Ca_3\ (PO_4)_2$—CaF_2; usually both are present as an isomorphous mixture. Sometimes the proportion of apatite is high enough to give a workable deposit, as in North Russia, Ontario, Norway, Spain and Virginia. Some apatite occurs also in sedimentary and metamorphic rocks, particularly crystalline limestones.

Monazite is a phosphate of cerium with lanthanum, yttrium, thorium and some silica also present. It occurs firstly as an accessory mineral in granites, gneisses, etc., and then as a heavy residue in sands derived from such rocks. Monazite sands occur in Brazil, India, Ceylon, Nigeria, Nyasaland, and Malaya, and in New South Wales at Byron Bay. Associated minerals may be garnet, magnetite, rutile, ilmenite and zircon. The chief value of monazite is as a source of thorium compounds used chiefly for gas mantles, though thorium, may, in the future, become an important source of atomic energy.

Xenotime, a phosphate of yttrium $YtPO_4$ is a fairly constant accessory in muscovite granite.

Amblygonite, a phosphate and fluoride of lithium and aluminium, is important as a source of lithium salts. Limited quantities of this mineral occur at Euriowie, 50 miles north of Broken Hill in pegmatite veins and lenses associated with tinstone, tourmaline and topaz. The lithia content is about 9 per cent.

Torbernite is a phosphate of copper and uranium occurring in South Australia, Cornwall, and Saxony. *Uranocircite* is a uranium and barium phosphate and *Autunite* a phosphate of uranium and calcium.

Pyromorphite, a lead ore, is a chlorophosphate of that metal, and the gem *Turquoise*, is a hydrous phosphate of aluminium with some copper oxide.

The Phosphorus Cycle in Nature.

The phosphorus cycle in nature may be considered as beginning with apatite, by far the most important of the phosphate minerals. It is dissolved from primary rocks by carbonated waters during weathering, and thus phosphate finds its way into soils, streams and the ocean. From the soil it is taken up by plants and passes from them in part into the bodies of animals.

Solutions of calcium phosphate react readily with hydroxides of iron and aluminium, and many secondary phosphate minerals are formed in this way, particularly under swampy conditions—vivianite, an iron phosphate, and wavellite, an aluminium phosphate, are the best known.

Phosphate in sea water is partly taken up by marine plants, such as the blue-green algae, and in a series of steps involving molluscs, crustaceans, fish and sea birds, guano deposits are built up on numerous oceanic islands. Atmospheric waters acting on the guano deposits carry phosphate down to the rocks underneath—these are frequently limestone, in which case rock phosphate is formed; if igneous rocks are present aluminium phosphates are formed. Phosphatic deposits in caves result from accumulations of bat guano and animal bones.

The largest and most valuable deposits of phosphate are those originally formed on the sea floor. These are chiefly organic residues, though chemical and bacterial precipitation play some part. One authority, Mansfield, suggests that fluorine liberated during volcanic activity has helped to fix phosphate as the relatively insoluble calcium fluor-phosphate. Shells, bones and tissues of marine animals accumulate in the ooze of the ocean bottom, and, because calcium phosphate is less soluble than calcium carbonate, the partial removal of the latter tends to concentrate the phosphate. This solution of calcium carbonate is hastened by the production of CO_2 formed by the decomposing organic matter. Some phosphate also dissolves and is redeposited around nuclei of shell or bone, forming the phosphatic nodules which are so commonly

found on the ocean floor and in beds of rock phosphate.

There is much variation in the phosphate content of marine organic remains—bones and crustacean residues are very rich; molluscs and corals very poor. Some brachiopods are rich in phosphorus, as are also annelids and fossil trilobites. Some minute crustaceans which make up a large portion of the marine plankton are geologically significant. Their skeletons consist almost wholly of calcium phosphate, and as they represent food for the larger marine animal forms, they are an early stage in the concentration of the phosphorus of sea water.

After phosphatic sediments are elevated to form dry land, further concentration of phosphate often takes place as excess calcium carbonate is leached away.

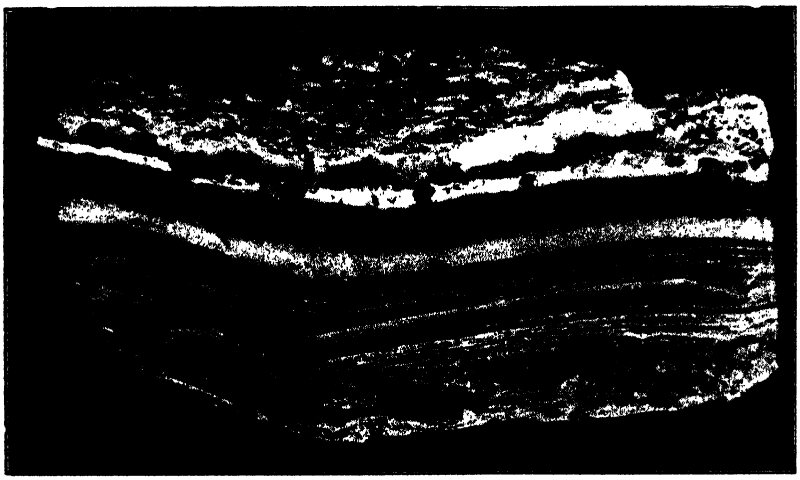
Phosphate deposits are worked on a large scale in Florida, Idaho, Montana, Wyoming, Utah, Tennessee, Russia, North Africa, Nauru and Ocean Island, and some phosphate is obtainable in most countries of the world. The beds have a very wide range in geological age—Cambrian to Pleistocene.

Phosphorus in Agriculture and Commerce.

The world production of phosphate normally reaches about twelve million tons, of which the United States of America produces 33 per cent., Tunisia 16 per cent., Morocco 13 per cent., Nauru and Ocean Islands 11 per cent., Russia 8.5 per cent., Algeria 4.8 per cent., and Egypt 4.6 per cent.

About 90 per cent. of all phosphate quarried is used as fertilizer. The remaining 10 per cent. finds an application in the manufacture of phosphorus and its compounds, in the iron and steel industry, and for rust-proofing, in matches, vermin exterminators, fireworks, shells, grenades, tracer bullets, smokescreens, distress signals, medicines, soft drinks, cements, baking powder, self-raising flour, yeast, table salt, photography, and ceramics.

Bones, fish and guano were used as fertilizers by the Carthaginians, Romans and American Indians, as well as by Europeans of more recent times, but their value was originally believed to reside in the fat and gelatine content. Later when the role of phosphate in plant and animal nutrition was understood, bones became increasingly popular as fertilizers in England, and the German chemist Liebig had some caustic remarks to make about the English import trade. Bear quotes Aikman's translation of a comment by Liebig, as follows:—"England is robbing all other countries of the condition of their fertility. Already in her eagerness for bones she has turned up the battlefields of Leipsic, of Waterloo, and of the Crimea; already from the Catacombs of Sicily she has carried away the skeletons of many successive generations. Annually she removes from the shores of other countries to her own the manurial equivalent of three millions and a half of men whom she takes from us the means of supporting, and squanders down her sewers to the sea. Like a vampire, she hangs upon the neck of Europe—nay of the entire world—and sucks the heart-blood from the nations without a thought of justice towards them, with-



Rock Phosphate from Ocean Island.

out a shadow of lasting advantage to herself."

It was Liebig who first suggested that bones might be dissolved in sulphuric acid to increase the availability of the phosphate. Lawes of Rothamstead patented the method in 1842; later the process was applied to phosphate rock and thus the superphosphate industry was founded.

Most of the phosphorus now applied to soil has its origin in deposits of phosphate rock. Much of the bone coming from slaughterhouses is now used for purposes other than fertilizers, although both raw and steamed bone are still of some importance either alone or as "blood and bone."

Raw bone meal contains 2½ to 3 per cent. of nitrogen and steamed bone 1 to 1½ per cent. in addition to phosphate. Steaming of bone permits of finer grinding, and therefore better distribution in soil and higher availability.

Ground phosphate rock and calcined phosphate rock are sometimes used as fertilizers, but superphosphate is by far the most important. By converting some phosphate rock to phosphoric acid and using this instead of sulphuric acid, concentrated superphosphates can be produced—also, where ammonia is used in addition, ammonium phosphates and ammoniated superphosphate, both of which supply nitrogen as well as phosphorus.

An important phosphatic fertilizer in some countries is basic slag. This is a by-product of the smelting of iron ores by the Thomas and Gilchrist process, in which limestone is used as a flux to remove phosphatic impurities from the iron.

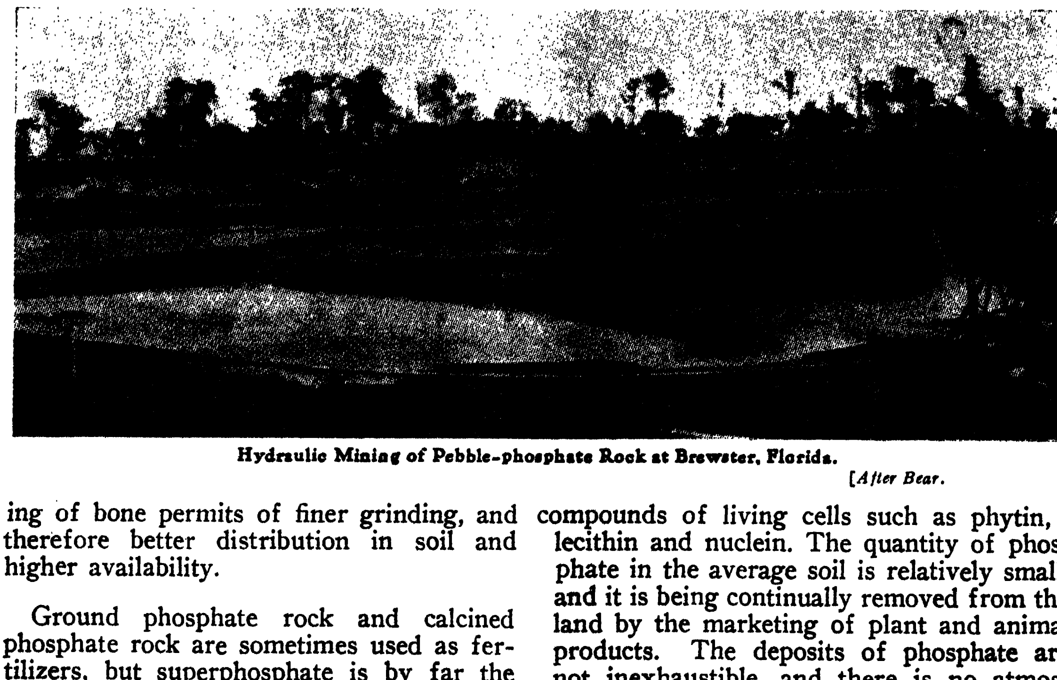
Animal or bone charcoal is obtained by heating bones out of contact with air—it is a decolourising agent containing about 10 per cent. of carbon and 90 per cent. of calcium phosphate. Bones heated in air yield bone ash used in the manufacture of porcelain, cupels, baking powder, phosphorus and fertilizer.

Australia's Phosphate Problem.

The conservation of phosphates is a matter of great significance in the national economy of any country. Phosphorus is essential to both plants and animals—apart from its occurrence in skeletal structures (bones, teeth, shells, etc.), it enters into compounds of living cells such as phytin, lecithin and nuclein. The quantity of phosphate in the average soil is relatively small, and it is being continually removed from the land by the marketing of plant and animal products. The deposits of phosphate are not inexhaustible, and there is no atmospheric reserve as in the case of nitrogen.

These remarks apply with particular force to Australia, which has no extensive phosphate deposits, and which exports large quantities of phosphate-bearing agricultural products. Phosphorus in plants tends to be concentrated in the seed, and therefore the exporting of crops like wheat represents a heavy drain on soil phosphate.

(*Continued on page* 30.)



Hydraulic Mining of Pebble-phosphate Rock at Brewster, Florida.

[*After Bear.*

FRUITGROWING.

BORON DEFICIENCY IN APPLES.

Observations at New England Experiment Farm.

J. A. HOLBECHE, H.D.A., Fruit Instructor.

THE occurrence of what was then known as Cork, Crinkle Cork, Confluent Pit or Crinkle and Pig Face in apple fruits was, but a few years ago, one of the major problems confronting orchardists in certain districts of this State. Since it has been found, however, that these disorders are caused by boron deficiency, growers are able to obtain complete control of the condition by the application of borax.

The function of boron in the physiology of the tree is not clearly understood, but although it is required only in minute quantities, a deficiency of it will cause serious crop losses and restriction of normal tree growth.

In 1937 the Department, after carrying out extensive investigations in the Kentucky district of New South Wales, made certain recommendations concerning the use of borax for the control of internal cork, from which growers in many parts of this State have received much benefit. However, as there were still many important details concerning boron and the use of borax in orchards, which required further investigation, the work has been continued at the New England Experiment Farm. It is the purpose of this article to discuss these investigations.

Symptoms of Boron Deficiency.

Growth Symptoms.

Apple trees which by the appearance of their fruits are obviously suffering from boron deficiency, often show growth symptoms also. Several Granny Smith trees at Glen Innes showed a severe dying back of the shoots and limbs. In some cases whole limbs were affected.

Shoots after commencing to grow at the beginning of the season, die back and leave dead sticks projecting above the green foliage. The dead leaves often adhere to the affected shoots. Leaves at the base of shoots which have died back are often deformed, being smooth in appearance and occurring in widely spaced tufts.

A general yellowing of the leaves and their early fall in the autumn can also be attributed in many cases to boron deficiency (leaves from affected trees show, on analysis, a much lower boron content than those from trees which carry normal fruit).

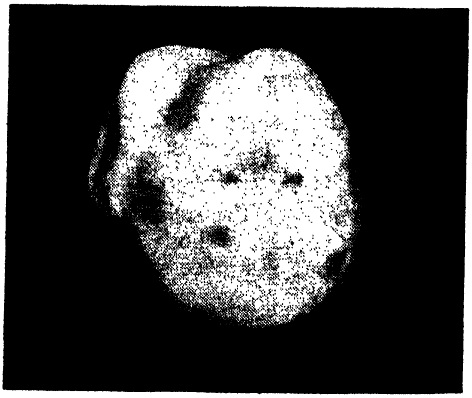


Fig. 1.—Granny Smith Apple from a Tree Not Treated with Borax.
Showing severe crinkling and indications of internal corking.

Fig. 2.—A Granny Smith Apple showing Severe Internal Corking associated with Crinkle.

The growth symptoms at Glen Innes were extremely variable and often trees which appeared quite healthy produced fruit very severely affected with corking.

Fruit Symptoms.

For all practical purposes boron deficiency is recognised most readily and surely by the condition of the fruit. The presence of a typical, corky condition on the skin or in the flesh of the fruit is a sure indication that the disorder is caused through a deficiency of boron. The fruit symptoms vary according to stage of development, variety and severity. Affected fruits may be found on any tree irrespective of age. In several instances fruits showing boron deficiency have been found on young trees during their first year of cropping.

Fruits affected by boron deficiency usually mature at least a week before normal fruits.

fell from the trees early in the year. The flesh of affected fruits is usually tough and inclined to be dry and lacking in flavour. When cork is present early in the season, affected fruits are often very hard, with poorly developed seeds.

The results of germination tests with apple seeds show that seed from very corky fruit is poorly developed. While seeds from normal Granny Smith fruits gave a 67 per cent. germination, those from very corky fruits gave only 27 per cent. In the test all obviously useless seed was discarded before sowing. On cutting, many seeds extracted from corky Granny Smith apples showed a brown discolouration.

Classification of Fruit Symptoms.*

Although all the forms of cork tend to pass from one to another, they appear sufficiently distinct to warrant separation. Typically the distinctions are as under:—

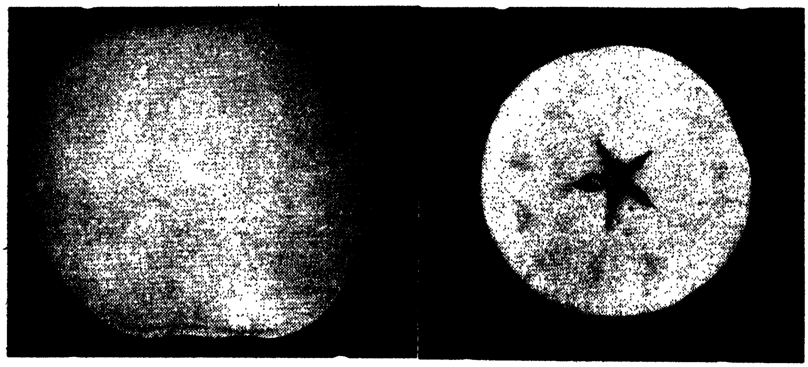


Fig. 3.—Granny Smith from Tree Treated with Borax.

Much variation in skin colour has been noticed, and in some cases it is possible to recognise the disorder as being due to boron deficiency by the abnormal colour of affected fruits. Severely affected Granny Smith apples yellow early in the season. Fruits from trees not treated with borax, even when not showing any effects of boron deficiency, yellow earlier than those from treated trees; whilst the skin of affected Democrat apples on maturity is usually a very dark red to almost black colour and dull in appearance compared with the normal bright red of healthy fruits.

Severely affected fruits often fall prematurely. During one season at Glen Innes most of the crinkled Granny Smith fruits

In *superficial cork* only the epidermal layers are affected and the fruits are not or only slightly misshapen, except as a result of cracking.

In *cork* the lesions are developed close to or involve the epidermis. The fruits are consequently malformed.

In *internal cork* the lesions are formed in the core or cortex, or both, and the fruit is frequently, but not necessarily, malformed.

In *corky core* the core becomes dry and brown. There are no other lesions and the fruit is not malformed unless other forms of cork are present.

* After W. M. Carne. (Unpublished article on non-parasitic disorders of apples.)

Superficial Cork.

The skin of affected fruits becomes roughened by the appearance of light brown areas. The roughened areas may appear on any part of the fruit, but most frequently

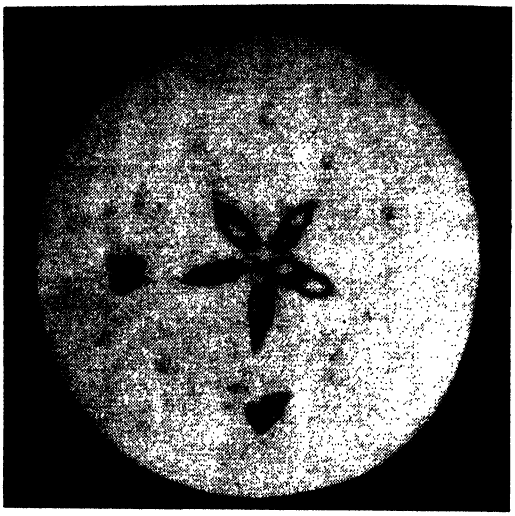


Fig. 4.—These Granny Smiths show Internal Corking, but no External Symptoms.

are apparent towards the calyx end. In the case of Jonathan apples, the affected parts often become dark and sunken and may show considerable cracking. Fruits at Glen Innes usually became affected early in the season. The flesh of affected fruits was mostly quite free from cork.

Jonathan and Stone Pippin varieties only are affected with superficial cork at Glen Innes.

Cork.

External indications in the form of raised brown or reddish brown spots or blisters are typical of this type of cork. The blisters in the case of the Jonathan variety are found on any part of the fruit; they vary in size, but are usually small and often not more than ⅛ inch in diameter. When the blisters are formed early in the season the fruits may become distorted.

Internally the symptoms vary considerably, but the presence in the flesh of dark brown to almost black lesions showing a greenish border is typical. The lesions are usually confined to the flesh within ½ inch of the skin; they may, however, extend to any part of the flesh. In the case of Democrat apples, the lesions may crack and leave cavities in the flesh close to the skin. At Glen Innes, Democrat and Jonathan are the only varieties of apples affected with this type of cork.

Internal Cork

This type of cork is the one most commonly found in many varieties of apples growing at Glen Innes. The condition is characterised by the presence of a number of brown corky areas distributed throughout the flesh of the fruit. The lesions commence as small, watery greenish spots in the flesh. These later dry out and form brown, spongy areas which harden with age. Internal cork was first noticed in one year during the last week of October, and every season affected fruits showing internal cork were noted by the middle of November.

Internal cork may be classified into two separate types as follows:—

(*a*) *Where There Are No External Indications.*—In this type the fruits may become affected early in the season, but usually when the surface of the fruit is not distorted, the lesions appear either in a very slight form early in the season, or as is most often the case, they start late in the season. Fruits thus affected show no

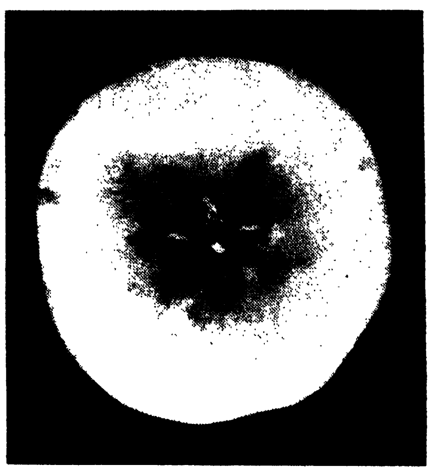


Fig. 5.—Corky Core of Granny Smith.

external symptoms. The lesions which form late in the season are often large and remain light brown and spongy.

(*b*) *Where There Are Surface Indications of Internal Cork.*—Fruits affected with internal cork early in the season often become very distorted, and when the condition is severe they may fall from the trees prematurely. The lesions usually become dry, hard and dark in colour. It is when these lesions are located close to the skin that the growth is checked and a crinkling of the contour of the fruit occurs. At Glen Innes severely affected Granny Smith apples show much of this crinkling in conjunction with internal corking. Crinkled fruits usually become yellow in colour prior to the normal harvesting period and at maturity may be very small.

At Glen Innes the variety Granny Smith was most severely affected with crinkling. Winesap showed some slight crinkling.

Corky Core.

The presence of corky, brown to almost black areas within the core is typical of this type. At Glen Innes the only varieties of apples affected with corky core alone are Jonathan and Golden Delicious. Affected Jonathan apples are, in some cases, normal in every respect except for corky areas within the core. In other cases the fruits are affected with cork as well as corky core. It is of interest to note that recently a number of Granny Smith fruits showing corky core only were found in an orchard in the Kentucky district.

Varietal Susceptibility at Glen Innes.

For a number of years past, records have been kept of the severity of corking in many varieties of apples each season. From these records it is apparent that the degree of severity varies considerably from year to year. The following is an example of the variation which occurs:—

Variety
Democrat.

1937 ..	Corking	very	slight.
1938 ..	,,	,,	severe.
1939 ..	,,	,,	slight.

An interesting example of the effects of boron deficiency on Rome Beauty and Fameuse apples has been recorded at Glen Innes. A number of old Fameuse apple trees growing in the Experiment Farm orchard were, years ago, worked over to Rome Beauty. These trees carried fruits of both the varieties, and it was noticed each year that on the one tree the Rome Beauty fruits were either completely free from or very slightly affected with corking, while the Fameuse fruits were consistently very severely affected.

The following is a list of the varieties of apples growing in the New England Experiment Farm orchard and their susceptibility to cork over a six-year period.

Variety.	*Type of Cork.*
Very Severely Affected:	
Granny Smith	Internal (severe " crinkle ") and corky core.
Fameuse	Internal (severe " crinkle ") and corky core.
Democrat	Cork and Internal.
Ohio Nonpariel	Internal.
Severely Affected:	
Stone Pippin	Superficial and Internal.
Jonathan	Superficial, Cork, Internal and Corky Core.
Tasmans Pride	Internal.
Mediums:	
Alexander	Internal.
Williams Favourite	Internal.
King David	Internal.
McIntosh	Internal.
Cleopatra	Internal.
Golden Delicious	Corky Core.
Winesap	Internal (some Crinkling.)
Slightly Affected:	
Crofton	Internal.
London Pippin	Internal.
Delicious	Internal.
Very Slightly Affected:	
Northern Spy	Internal.
Rome Beauty	Internal.
No Trace of Cork:	
Senator	
Buncombe	
Yates	
Wallace Howard	
Huntsman	
Stephens Seedling	
Milton	

The varieties Jonathan, Granny Smith and Fameuse are most consistently affected, and each year show severe corking. The trees of these varieties are amongst the largest and oldest growing in the orchard.

The Effect of Rainfall on the Severity of Cork.

Although the percentage of cork in fruits from untreated trees was very high in 1938 when the rainfall for the year was above the average, each year after it was noted that the corking was most severe when the rainfall was low. Probably the distribution of the

rainfall during the year is the most important factor influencing the severity of cork in the fruits. As boron is required only in minute quantities, any great reduction in the intake of plant foods as would be the case under dry conditions may mean that insufficient is available for normal growth.

Boron Content of Apple Leaves.

Leaves from a number of treated and untreated Granny Smith apple trees growing in the Glen Innes orchard were analysed to determine their boron content. As a result of this analysis, it appears evident that the quantity of boron present in the leaves is related to the appearance of cork in apple fruits. When the quantity of boron in the leaves was found to be in the vicinity of 12 p.p.m. the incidence of cork in the fruits was high, but when this amount was increased to 19 p.p.m. fruits were found to be quite free from corking.

The following is a tabulated record of the results obtained from the analyses which were carried out by the Chief Chemist of the Department:—

Treatment.	Total quantity of borax applied to soil.	No. years treated.	No. years since last treated.	Boron p.p.m. of moisture-free leaves.	Corky Fruits.
					Per cent.
½ lb. borax to soil 1937 ...	½	1	4	19·0	nil
¾ lb. borax to soil 1937 ...	¾	1	4	21·6	1
1 lb. borax to soil 1937 ...	1	1	4	19·5	nil
½ lb. borax to soil 1937, 1938, 1940	1½	3	1	15·6	4
2 lb. borax to soil 1937 only	2	1	4	40·6	nil
¾ lb. borax to soil 1937, 1938, 1940	2¼	3	1	32·9	nil
3 lb. borax to soil 1937 only	3	1	4	30·4	nil
1 lb. borax to soil 1937, 1938, 1940	3	3	1	31·2	nil
4 lb. borax to soil 1937 only	4	1	4	43·2	nil
2 lb. borax to soil 1937, 1938. 1940	6	3	1	36·3	nil
3 lb. borax to soil 1937, 1938, 1940	9	3	1	43·3	nil
5 lb. borax to soil 1937, 1938	10	2	3	31·2	nil
4 lb. borax to soil 1937, 1938, 1940	12	3	1	53·6	nil
5 lb. borax to soil 1937, 1938, 1940	15	3	1	42·4	nil
No treatment	...	...	...	12·9	Severe internal cork. Many fruits show crinkle.

(To be continued.)

The Heavy "Drop" of Citrus Fruit.

Influence of Tree Health.

R. J. BENTON, H.D.A., Special Fruit Instructor.

CITRUS growers are often perturbed at the failure of their trees to mature a crop corresponding to the amount of blossom produced. This, however, is a universal experience, and although, often, no definite cause can be traced, there are factors which, either alone or in combination, greatly influence the failure of the fruit to "set."

Usually, when the trees blossom in spring, they carry many more blooms than it would be possible for the trees to mature as fruit. Consequently as soon as profuse blossoming is over, a large proportion of the embryo oranges begin to fall. From that period onwards for some weeks, falling of fruit often continues to such a degree that by the time oranges are marble size, possibly 90 per cent., and sometimes more, of the young fruit has fallen.

At this stage the oranges remaining may be noticed to be generally increasing in size, though odd fruits may begin to lose their bright lustre and stop growing. These later become duller in colour and also fall. Generally, it is in December that this is specially noticeable. If fruit drop or shedding is heavy, very little to no fruit at all may remain on the tree after early January. In some seasons shedding occurs even a little longer, when oranges may be up to 1½ inches in diameter. The final setting of crop is usually only apparent late in January.

If a tree blossoms well in spring, a final setting of from ½ to 1 per cent. of fruit to blossom results in a good crop being borne. A much greater percentage of

(Continued on page 26.)

Seed Wheat and Oats for 1946 Sowing.

List of Growers of Approved Seed.

IT has been decided to publish again this year a list of growers of approved seed wheat and oats who have supplies available for sale. The crops of the growers listed were inspected by officers of the Department and reached a standard of purity and trueness to type up to the approved standard.

Growers listed should notify the Department immediately their available seed of any variety is exhausted.

Wheat.

Bencubbin.—
Carney, C., "Maranoa," Ulamambri.
Ward, H. E., "Gwenvale," Parkes.
Harley, H. J., "Wattle Park," Tulligibeal.
McLaren, G. J., "Glenmore," Barmedman.
Cullen Bros., Bunglegumbie, via Dubbo.
Donnett, H., "Braemar," Gulargambone.
Idiens, E., "Kangarooby," Gooloogong.

Bordan.—
Dunkley, A. D., "Bon Lea," Brundah, via Grenfell.

Bungulla.—
Heckendorf, H. F., "Noorongong," Forbes.

Eureka.—
Idiens, E., "Kangarooby," Gooloogong.

Ford.—
Hall Bros., "Ellerslie," Wallendbeen.
Howard, G., Kallara, Springdale.
Fitzgerald, K., Box 294, Griffith.
McLaren, G. J., "Glenmore," Barmedman.
Downing, R., "Merton," Dubbo.
Donnett, H., "Braemar," Gulargambone.
Idiens, E., "Kangarooby," Gooloogong.
Robson, C. C., "Norcia," Rivers Road, Canowindra.
McDonald, H. H., "Belmont," Canowindra.

Gular.—
Cullen Bros., Bunglegumbie, via Dubbo.
Byrnes, E., "Glen Ayr," Burnett.

Javelin.—
Carr, R. T., "Enfield," West Wyalong.
McLaren, G. J., "Glenmore," Barmedman.

Koala.—
Heckendorf, H. F., "Noorongong," Forbes.

Rapier.—
Carney, C., "Maranoa," Ulamambri.
Carr, R. T., "Enfield," West Wyalong.
Ward, H. E., "Gwenvale," Parkes.
Idiens, E., "Kangarooby," Gooloogong.

Waratah.—
Bradford, R., "Cooringle," Nubba.
Idiens, E., "Kangarooby," Gooloogong.

Oats.

Algerian.—
Wilson, R. & Sons, "Fairview," Oberon.
Dickson, A. S., "Yurunga," Oberon.
Witten, R. A., "Willowbank," Oberon.
Howard, G., "Kallara," Springdale.

Belar.—
Hall Bros., "Ellerslie," Wallendbeen.
Hill, A. H., "Carawatha," New Molyan, via Mendooran.
Witten, R. A., "Willowbank," Oberon.
Uther, L. F., "Myonah," Cowra.
Ward, H. E., "Gwenvale," Parkes.
Cullen Bros., Bunglegumbie, via Dubbo.

Brigalow.—
Wilson, R. & Sons, "Fairview," Oberon.

Fulghum.—
Crick, P., "Mayfair," Gollan.

Kurrajong.—
Ward, H. E., "Gwenvale," Parkes.

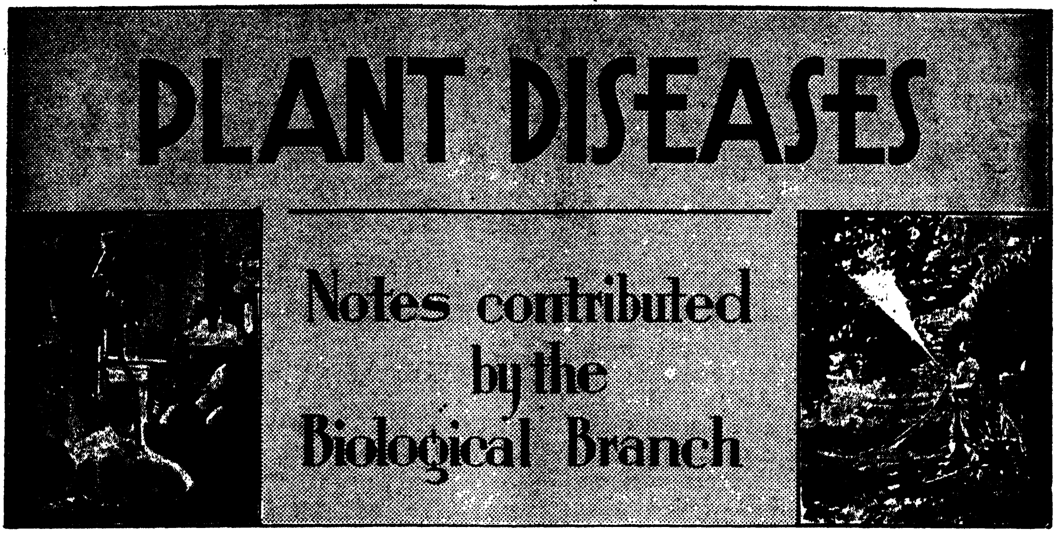
Junior Farmers Essay Competition Results.

THE Junior Farmers' Club Council has announced the results of the Essay Competition for scholarships awarded by the Rural Bank.

Les Scott, of Farm 1845, Lake Wyangan, via Griffith, wins the three-year scholarship tenable at Hawkesbury Agricultural College.

Margaret Bower, Oceanview, Billinudgel, via Mullumbimby, wins the fees and materials for a four-year course in Women's Handicrafts at Sydney Technical College.

Competitors were required to write an essay on "What I have gained through being a Junior Farmer, with particular reference to my Club projects," and to have done work of merit in connection with at least one approved Junior Farmer Club project over the twelve months prior to the 30th June, 1945.



SOIL-BORNE DISEASES.

Importance of Crop Rotation.

IN a recent book* S. D. Garrett, of the Rothamsted Experimental Station, has brought together what is known regarding soil-inhabiting fungal parasites and their relations with their environment and the plants which they attack. For the last decade or more the author has been concerned in the elucidation of various problems associated with root disease, primarily "take-all" of wheat, first at the Waite Institute in South Australia and later at Rothamsted, and he has a knowledge and understanding of the difficult group of root disease fungi which is unrivalled.

The following notes present some of the views set out by Garrett:—

The Soil Flora.

The soil is not merely an inanimate aggregation of mineral particles. It is the home of vast numbers of fungi, bacteria, protozoans, etc. The fungus flora includes the *saprophytes*—moulds of diverse relationships which feed on dead parts of plants, breaking their complex organic compounds down to simpler forms ultimately available again to the green plants—and *parasites* which can infect the roots of higher plants. An understanding of the behaviour of the parasites in the soil and their relationships with the rest of the soil flora is basic to the development of any system of control.

Since organic compounds constitute only a small fraction of the soil, competition for it between the various soil organisms is intense, and any advantage which an individual fungus or bacterium may possess will give it a greater chance of survival. Normal soil saprophytes are usually unspecialised types with the ability to grow and produce spores under a wide range of conditions. There are, however, certain broad groupings; some have special ability to digest woody tissue, others cellulose, proteins, fats, etc., so that during the decomposition of a dead plant there is a sequence, different phases being characterised by different fungus assemblages.

Soil Inhabitants and Soil Invaders.

Garrett envisages the parasites as falling broadly into two classes, which he terms soil inhabitants and soil invaders. The *soil inhabitants* are primitive and unspecialised, and are able to maintain a saprophytic existence in competition with the non-parasitic soil fungi, between phases of parasitism. Most parasites he classes as *soil invaders*. The special ability which para-

* Root Disease Fungi, 1944. Chronica Botanica Press.

sites have of attacking living roots gives them an advantage over the saprophytic moulds, thus upsetting the balance of the soil flora, but this is usually offset by losses in other directions. The soil invaders may have characteristics of slow growth, specialised food requirements, vulnerability to change in the soil environment, which prevent them competing on an equal basis with the saprophytes.

The more highly specialised the parasite, the less able is it to maintain a saprophytic existence in the soil organic matter in competition with saprophytes, and it may be limited to survival in the tissues of the root which it invaded and killed as a parasite, gradually dying out as competition becomes more intense. Resting organs, spores or sclerotia (masses of thick-walled tissue) are usually developed as the vegetative or expanding phase of growth ceases, and these may suffice to tide the fungus over between crops.

The parasitic ability of the individual soil-inhabiting parasites varies greatly. Some, as *Sclerotium rolfsii, Sclerotinia sclerotiorum,* the Texas root rot (*Phymatotrichum omnivorum*), some *Phytopthora* species and *Pythium* species appear to be unspecialised, attacking a wide variety of host plants. Until recently, it was thought that the root-knot-causing eelworm *Heterodera marioni* also belonged in this category, but recent American work has shown that there are at least three strains: one attacks lucerne, but not peanuts or cotton; another attacks cotton but not lucerne or peanuts; and a third attacks peanuts and also lucerne, but not cotton. Tobacco and tomato are susceptible to all three, but different types of galls are produced on them by the different strains.

The existence of strains of a species specially adapted to attack a particular host is most important when control measures are being worked out. Perhaps the most interesting from this point of view is the fungus *Rhizoctonia solani.* This is of world-wide distribution, and is probably often present as a normal constituent of the soil flora. There are very many strains of this fungus; some, probably almost, if not entirely, saprophytic, others attacking such diverse hosts as potatoes, wheat, beans, cabbages, etc. Each strain has a different host range, often partly overlapping the range of another strain. In the case of a variable fungus, such as this, it seems conceivable that a strain of special parasitic ability might be evolved in an area simply by growing there continuously the same crop year by year. Other parasites again are restricted to members of a single family, as clubroot of crucifers, or a single genus or even species (Fusarium diseases of peas, potatoes, beans). For all soil parasites there is a combination of temperature and moisture and other environmental conditions which is specially conducive to the development of the parasitic phase.

Control Measures.

Control measures depend on the type of crop, *i.e.*, annual, perennial, intensive. The basic type of control is the use of resistant varieties, and the production of specially desirable types resistant to disease is a major task of the plant breeder. Setbacks can occur in this type of work owing to the appearance of new strains of the parasite.

In the case of intensive crops, steaming or chemical treatment of the soil is possible.

Crop Rotation.—The main control for diseases of annuals, *e.g.*, cereals and vegetables, which constitute the bulk of agricultural crops, is crop rotation. Parasites gradually die out if no host plant is available, and the rapidity of this dying out may be hastened by some agricultural practices. The length of the rotation and the choice of alternate crops depend on the disease present, whether an unspecialised or adaptable species or one of limited parasitic ability, on the length of time it can remain saprophytically in the soil, and its type of spores or other resting bodies. A rotation which might be suitable for Fusarium wilt disease might, for instance, be quite wrong for root-knot. There is obviously much need for further field research into these problems.

The growing of a crop in the same ground year by year inevitably results in the building up of some disease-causing organism in the soil. Continual growing of potatoes without rotation in some tableland areas has resulted in increase in *Fusarium* and *Verticillium* which cause wilt diseases, and of the root-knot eelworm. In some of the coastal areas where beans or peas or tomatoes are continuously grown, *Rhizoctonia, Fusarium,*

etc., have become very important. An example specially quoted by Garrett is the intensification of the "take-all" disease in parts of the wheatgrowing districts of Australia by the continual growing of this crop without rotation. He even goes so far as to suggest that it may have been to Australia's ultimate benefit that this should have occurred, in that the disastrous losses occasioned by "take all" have compelled the wheatgrower to adopt a reasonable system of crop rotation.

As well as the actual time factor involved in crop rotation, the debris of non-susceptible crops stimulates the growth of soil saprophytes, and this may have a further beneficial effect in killing out the parasitic types. The incorporation of green crops, animal manures and pasture residues may hasten this process.

New Plant Diseases.

DURING the nineteen months ended 30th November, 1945, the following diseases were recorded for the first time in New South Wales:—

Acer polymorpha (Japanese Maple)—*Verticillium dahliae* Kleb. (Die-back); Woodford.

Adiantum aethiopicum (Maiden-hair Fern)—*Gloeosporium* sp. (Leaf spot); Metropolitan Area.

Ananas sativa (Pineapple)—*Saccharomyces* spp. (Yeasty rot in plantations); North Coast.

Antirrhinum majus (Snapdragon) — *Phytophthora* sp. (Collar rot); Metropolitan Area.

Aquilegia vulgaris (Columbine) — *Erysiphe polygoni* DC. (Powdery mildew); Metropolitan Area.

Bassia birchii (Galvanised Burr)—*Puccinia bassiae* Samuel (Rust); Moree.

Beta vulgaris (Beetroot)—*Aphanomyces* sp. (Beet sickness); Metropolitan Area.

Bidens pilosa (Farmers' Friend)—*Entyloma* sp. (Leaf spot); Somersby.

Callistephus chinensis (Aster)—*Pythium* sp. (Root rot); Metropolitan Area.

Camellia japonica (Camellia)—*Gloeosporium* sp. (Canker); Metropolitan Area.

Campanula media (Canterbury Bell)—*Sclerotinia sclerotiorum* (Lib) de Bary (Wilt); Metropolitan Area.

Chrysanthemum sp. (Chrysanthemum)—*Macrophomina phaseoli* Ashby (Root rot); Metropolitan Area.

Cryptostemma calendulaceum (Capeweed)—*Peronospora* sp. (Downy mildew); Glenorie.

Daucus carota (Carrot) — Mosaic (virus); Leeton, Metropolitan Area.

Gardenia intermedia and *G. florida* (Gardenia)—*Heterodera marioni* (Cornu). Goodey (Root knot); Metropolitan Area.

Gerbera jamesoni (Gerbera)—*Phytophthora* sp. (Collar and root rot); Metropolitan Area.

Gladiolus sp. (Gladiolus)—*Sclerotinia gladioli* Drayt. (Neck rot); Metropolitan Area.

Lantana camara (Lantana)—*Phytophthora parasitica* Dast. (Crown and root rot); Tweed River.

Lathyrus odoratus (Sweet pea)—*Pythium* sp. (Root rot); Metropolitan Area.

Lunaria biennis (Honesty)—*Phytophthora* sp. (Crown rot); Metropolitan Area.

Lupinus sp. (Lupin)—*Pythium* sp. (Root rot); Metropolitan Area, Narara.

Lycopersicum pimpinellifolium (Currant tomato) — *Cladosporium fulvum* Cooke (Leaf mould); Metropolitan Area.

Mangifera indica (Mango)—*Oidium* sp. (Powdery mildew); Metropolitan Area.

Matthiola incana (Stock)—*Pythium* sp. (Root rot); Metropolitan Area.

Oenothera rosea (Oenothera)—*Pythium* sp. (Root rot); Metropolitan Area.

Papaver nudicaule (Iceland poppy)—*Sclerotinia sclerotiorum* (Lib) de Bary (Wilt); Metropolitan Area.

Pastinaca sativa (Parsnip)—*Ramularia pastinacae* Bubak, and *Cercosporella pastinacae* Karst (Leaf spots); Panania.

Plumeria acutifolia (Frangipanni)—*Phomopsis* sp. (Die-back); Metropolitan Area.

Primula malacoides (Primula)—*Phytophthora* sp. (Crown rot); Metropolitan Area.

Poncirus trifoliata (Trifoliate orange)—*Heterodera marioni* (Cornu) Goodey, (Root knot); Metropolitan Area.

Ranunculus sp. (Ranunculus)—*Pythium* sp. (Root rot); Metropolitan Area.

Sechium edule (Choko) — *Erysiphe cichoracearum* DC. (Powdery mildew); Metropolitan Area.

Sterculia diversifolia (Kurrajong) — *Phytophthora parasitica* Dast. (Root rot); Murrumbidgee Irrigation Areas.

Tagetes sp. (French marigold)—*Phytophthora cryptogea* Pettybr. & Laff. (Collar rot); Metropolitan Area.

Viola tricolor (Pansy)—*Pythium* sp. (Root rot); Metropolitan Area.

Zinnia sp. (Zinnia)—*Pythium* sp. Root rot); Metropolitan Area.

The Heavy "Drop" of Citrus Fruit—*continued from page 21.*

flowers mature fruit when the blossoming is less profuse.

It is impracticable to influence appreciably the number of blossoms produced by a tree. All that is practicable is to ensure that the tree condition is sufficiently satisfactory to nurture and support as long as is possible the blossoms produced. This entails maintaining fertility, especially the nitrogen supply, at a satisfactory level. The tree must make reasonable growth, have satisfactory size and sufficient large-sized leaves to elaborate the sap and store requirements for the tree's future needs.

Meeting the fertiliser requirements and judicious waterings are essential to satisfactory tree health. A soil moisture condition neither too dry nor too wet is necessary. Disturbance of the soil too deeply is likely to affect root activity, thus interrupting the nutritional supply.

Beyond observing these requirements, little can be done to aid the tree further in holding its crop, though a very great influence results from climatic conditions.

High winds greatly increase the rate of transpiration, which results from high temperatures with low humidities. Such conditions affect fruit setting, particularly if soil moisture is very low.

Practices which tend to minimise the effects of adverse climatic influences during spring and early summer are likely to be helpful. These are: (1) to ensure soil moisture being available to the trees, mulch the land where possible to reduce temperature of the surface soil, thus minimising evaporation and lowering the rate of transpiration; (2) avoid cultivating and loosening the soil so as to restrict undue aeration and possible injury to superficial roots of the trees.

In cases where the trees are in poor condition, showing little growth, small size of leaves and foliage not fairly dense, improvement in tree condition should be attempted. Only success in that direction can result in subsequent blossoming being fruitful.

Summary.

(1) Orange trees everywhere are prone to shed or drop newly-formed fruits.

(2) The severity of the "drop" is influenced by tree health and also by abnormal climatic conditions.

(3) Tree health can be ensured by a suitable soil condition, and ample complete fertiliser and soil moisture.

Facing of Cherries Prohibited.

"ROW-FACING", "bunch-facing" or any similar method of packing cherries is now prohibited by law.

"Cherry growers, shopkeepers and the public should note that a recently gazetted regulation prohibits the packing of cherries by the methods known as 'row-facing' or 'bunch-facing' or in any similar manner," said the Minister for Agriculture (Hon. E. H. Graham, M.L.A.). "The sale of cherries so packed is also prohibited."

The Minister also warned against the dishonest practice of "topping" cherries—the placing of superior cherries on the upper surface and inferior fruit underneath.

The penalty for any of the foregoing practices was up to £50.

Notes on—

The Storage of Vegetables for Processing.*

E. G. HALL, B.Sc.Agr., Fruit Research Officer.

IT is sometimes necessary to store vegetables for various periods before consumption or until they can be handled by processing plants. Vegetables are often diverted from processing plants because they cannot be used immediately, yet they possibly could be used within a period during which they could be satisfactorily stored. A proper appreciation of the requirements for successful storage of vegetables and the possibilities of efficient storage would assist in maintaining maximum output for a much longer period than is at present achieved.

The following notes have been prepared to supply information on efficient methods of handling and storing the common vegetables.

Handle Carefully.

Vegetables intended for storage must be carefully handled as injuries increase the rate of deterioration due to wilting, loss of quality and decay during storage. All diseased or injured material should be removed after harvesting or after delivery, and only sound, fresh, good quality material should be stored.

Cool Storage is Generally Best.

Whenever space is available, cool storage at 32-34 deg. Fahr. should be used for all vegetables except potatoes, sweet potatoes, pumpkins and tomatoes.

For the latter vegetables shed temperatures exceed the optimum for common storage for the greater part of the year in most areas and some refrigeration is very desirable.

However, existing cooling storage space is very limited and the vegetables will often have to be stored at atmospheric temperatures. In cooler areas hard vegetables can be successfully common stored for quite long periods during the winter and early spring months. While data for desirable relative humidities in store are given in this paper, it is realized that few cold stores are equipped with humidity control.

Avoid Shrivelling.

It is important that vegetables should be maintained in a firm, crisp and fresh condition as long as possible. Therefore, during storage it will be particularly important to minimize shrinkage. It has been shown that shrivelled roots do not process as well as firm ones, so that shrinkage will often be the main problem in storage.

Ventilation is Important.

Nevertheless the provision of ample ventilation both in cool storage and in common, or shed, storage is essential. Vegetables should be stored in crates or boxes wherever possible. When such rigid and open containers are stacked on a false floor or on dunnage, and when they are spaced to provide a fair amount of air circulation, they allow adequate ventilation of the produce. The bags usually used for hard vegetables, and known as "Chapman" sacks, are often unsatisfactory as storage containers because of the difficulty of providing ventilation. Open-mesh onion bags are more satisfactory, and are to be preferred when the use of bags is unavoidable. Such bags can be used successfully for hard vegetables.

Stacking of Bags.

Where large quantities of hard vegetables are to be stored in bags, the bags should be stacked in pillars formed by laying pairs of bags crosswise up to a height of not more than six bags. The bottom bags should be laid on a false floor of slats on 2 inch x 4 inch bearers, and the individual stacks or pillars should be separated by an air space of 3 or 4 inches.

Another good way to stack bagged produce, which has the additional advantage of providing vertical ventilating shafts, is shown in the accompanying sketches. With this method it is not usually necessary to leave a space between each individual stack or pillar.

* Also appeared in *Food Preservation Quarterly*, March/June, 1945.

Handling from Cool Storage.

If produce is taken straight from cool storage to atmospheric conditions during warm or damp weather, there is frequently a considerable condensation on the cool surface of the material. It is the more marked the higher the atmospheric humidity.

Such "sweating" is very undesirable and should be avoided wherever possible. Unless such wet produce dries out quickly it is very liable to rotting and breakdown. Sweating can be avoided by allowing the produce to warm up gradually by holding at an intermediate temperature of 45-50 deg. Fahr. for one to three days. If this is not practicable, the packages should be ventilated as thoroughly as possible on removal from cool storage, and the vegetables disposed of without delay.

Sweating will not be harmful if the vegetables are to be processed within 24 hours of removal from cool storage.

Inspect Frequently.

During storage the vegetables should be carefully inspected at frequent intervals, and removed at the first appearance of undue deterioration such as decay, sprouting or shrivelling. It never pays to keep deteriorated produce in storage, or to store produce which is initially of inferior quality or damaged in any way. The storage periods quoted later only apply under good conditions and with good vegetables. Often, in actual practice vegetables will have to be removed from storage after shorter periods, hence the warning that they should be inspected frequently. Unless frequent inspections are made during storage avoidable losses will occur.

The requirements for successful storage of the vegetables of importance for processing are outlined below.

Requirements for the Successful Storage of Potatoes.

Cool Storage.—Potatoes are best stored at a temperature of 42-45 deg. Fahr., with a relative humidity of 90 per cent. At lower temperatures the potatoes develop sugar and, besides becoming too sweet, are then liable to scorch during drying. At high temperatures sprouting becomes troublesome and shrivelling is increased. Potatoes should be held at a temperature of about 60 deg. Fahr. with a fairly high humidity for the first ten to fourteen days. This initial "curing" results in less rotting and less shrivelling. Under these conditions potatoes should keep satisfactorily in cold storage for periods up to six months. The bags should be stacked in the storage room on a false floor and spaced so as to allow good circulation of air through the stack.

Common Storage.—Potatoes can be successfully stored in sheds through the winter months in cool districts if certain precautions are taken to keep the shed temperature as low as possible and to provide ventilation. The storage shed should be in the coolest spot available, such as on a southern hillside, and should be sheltered from the sun. The buildings must have ventilating doors low down in the walls and high up in the roof. These would be closed on all except cold days and would be opened at night to take full advantage of the cool night air which will circulate through the shed and cool the potatoes.

If best results are to be obtained the shed should be insulated to reduce heating during the day. The insulation should be waterproofed on the inside. A cheap and satisfactory insulation is obtained by fastening wire netting 6 to 12 inches out from the walls and tightly packing the space with straw. To prevent condensate drip, the ceiling should be insulated more than the walls.

The potatoes should be stacked on a false floor and should be kept 6 inches clear of the walls. They may be stored in bulk in bins instead of in bags, if the bins are built clear of the walls and if vertical ventilating shafts are placed in the middle of the bin from the floor up. These shafts are built by nailing 18 inch lengths of 2 inch boards spaced 1 inch apart to 4 inch by 2 inch studs.

Pitting or Clamp Storage.—Although extensively practised overseas where the winters are more severe, clamp storage is of limited use in Australia, because it is difficult to keep the temperature of the potatoes low enough and it is difficult to ventilate them properly. Sprouting and rotting are often serious troubles, especially if the clamps are not properly constructed. However, clamping may be useful as a cheap method of storage during the winter months in the coldest parts of the country. Actually the storage is rarely underground because of difficulties of ventilation and

drainage; therefore the process is not strictly pitting and should be referred to as clamp storage.

A dry, well-drained spot should be selected on sloping ground. Two poles are placed on the surface, parallel and 4 feet apart. Straw or brush is placed on the ground between them and the potatoes piled in on the straw to make a conical heap or, if large quantities are being stored, the potatoes should be heaped in a well ridged row.

The potatoes are then thickly thatched with straight straw—wheat or rye straw being much better than oat or barley straw; reeds can also be used. The thatching is then covered with beaten-down sods of earth, the sodding being done from the bottom up to within 9 inches of the top, which should be covered with a straw ridge. The provision of additional ventilation by the use of piping coming through the top is desirable to reduce the risks due to excess moisture. Finally a drain 9 inches wide and 9 inches deep is cut around the clamp.

Potatoes must be well dried before clamping, as excess moisture causes excessive rotting. If weather permits, it is as well to leave the potatoes with only the straw covering for a fortnight or so to remove some of the moisture. Potatoes in clamps should keep satisfactorily for three to four months, that is, until the spring in cool highland areas.

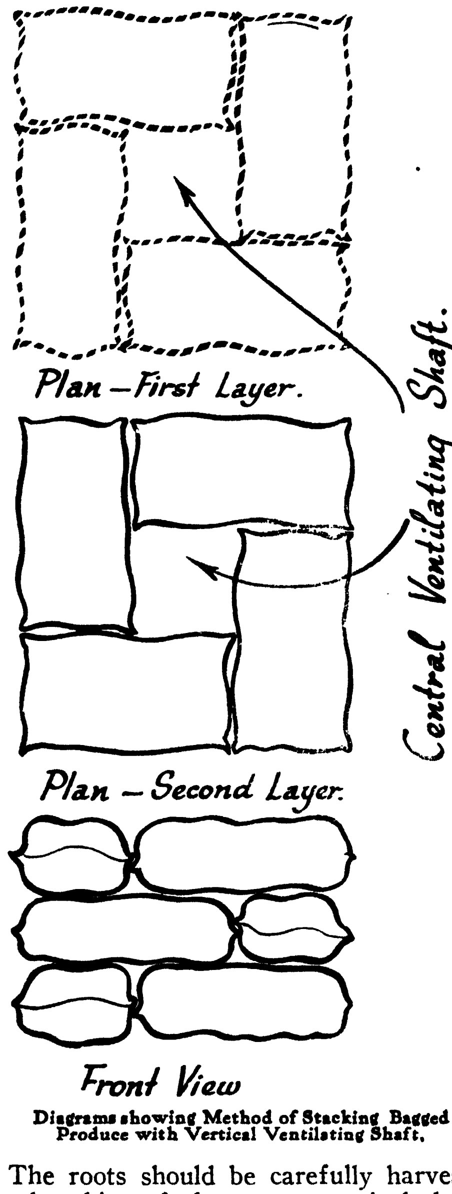
General.—Potatoes should be stored in the dark, as light causes a greening of the skin, and even partial exposure to light may cause a yellowing of the flesh. They should not be lifted until fully mature and should be thoroughly dry before being placed in storage.

Freshly dug potatoes can be held satisfactorily for several weeks at ordinary shed temperatures, even in warmer areas, provided that the stack is well ventilated. If it is noticed that the potatoes are shrivelling too much, they may be sprinkled with water, as required, but this precaution would only be necessary in warm, dry weather.

Certain varieties may be unsatisfactory for processing if they are cold-stored for long periods. This applies particularly to the Brownell variety for dehydration.

Carrots and Parsnips.

Cool Storage.—Carrots and parsnips are best stored at a temperaure of 32-34 deg. Fahr. with a humidity of 90-95 per cent. Under these conditions they will keep for four to five months.



Diagrams showing Method of Stacking Bagged Produce with Vertical Ventilating Shaft.

The roots should be carefully harvested as the skin, of the carrot particularly, is tender and easily injured. The tops should be cut off close. For cool storage the roots should be washed clean in running water, dried, and placed in crates or boxes. Owing to the difficulty of providing adequate ven-

tilation there is too much sweating in bags. If plenty of clean water is not available, carrots and parsnips are better not washed unless they have been dug from heavy soil and are very dirty.

Common Storage.—If unwashed and handled carefully, carrots and parsnips can be common stored for two to three months without undue loss in the manner described for potatoes. If shrivelling is noticeable, the bags should be sprayed occasionally with water and covered with damp bags. However, if the roots are too damp, or sweat due to inadequate ventilation, rotting may be serious.

General.—Wherever possible, only carrots from new ground should be stored. Watery Soft Rot caused by the fungus *Sclerotinia sclerotiorum* has been found to be responsible for much of the rotting of stored carrots. This disease originates in the field. Where carrots have been grown on the same ground for some time the roots will be considerably infected with this fungus which will cause considerable rotting if the roots are subsequently stored or if they are transported long distances with insufficient ventilation.

Short varieties of carrots, such as Chantenay, keep better than long varieties, principally because shrinkage is less. Under warm, dry conditions, the rate of shrivelling of carrots and parsnips can be very rapid.

Carrots, particularly, require good ventilation during storage as they give off moisture and carbon dioxide in considerable quantities.

Freshly-dug carrots and parsnips can be held satisfactorily for two or three weeks at ordinary shed temperatures, even in warmer areas, provided that the stack is well ventilated and that, when necessary, precautions are taken to reduce shrivelling.

(To be continued)

The Geological Sources of the Commoner Chemical Elements.

(Continued from page 16.)

Other mineral nutrients are contained in larger amounts in the roots and stalks of plants which are largely returned to the soil.

The beneficial effects of the applications of phosphate include greater rapidity of early growth, early maturity, and increased development of the root systetm. Phosphorus plays a part in such physiological processes as cell division, sugar metabolism and photosynthesis.

New South Wales in normal times obtains its phosphate from Nauru and Ocean Islands. Local deposits in caves at Wellington, Stuart Town, Borenore, Ashford, and Molong, and a surface deposit at Canowindra, are of negligible value.

Phosphate Fixation in Soil.

Only a relatively small percentage of the phosphate applied to a soil is recoverable in crops—much remains in the soil in a comparatively unavailable condition. This is particularly true of soils which have a high iron and aluminium content, the phosphates of these metals being largely insoluble. Under such conditions correct fertilizer placement is important. Band application and the use of granular forms of superphosphate are advantageous. Of recent years good results have been claimed for the use of serpentine superphosphate under New Zealand conditions, where fixation of phosphate has been a problem in some parts. This fertilizer is made by mixing superphosphate with ground serpentine; it is claimed that the water soluble phosphate reverts to a form less soluble but still available for crops.

(To be continued.)

Importance of the Dairying Industry.

THE production of milk per anuum in Australia ranges from 950,000,000 gallons to 1,250,000,000 gallons according to seasonal conditions. The cash income from dairying is approximately one-seventh of the total from agricultural and pastoral sources. Of all persons over 16 years of age one in twenty-five earns his or her living directly from dairying. About 3¼ million cows are required to be kept in milk to maintain the industry on the present basis of production. In a good season, in addition to other milk products such as condensed milk, cheese and milk powder, as much as 112,000 tons of butter are exported from Australia to other countries, principally the United Kingdom.

In New South Wales there are approximately 44,000 people engaged in production on dairy farms.

Approved Seed—January, 1946.

To assist in the production and distribution of approved seed of recommended varieties of crops and vegetables, the Department publishes in this list each month the names and addresses of growers of such seed. For this service a charge of 2s. 6d. is made for each insertion of each variety listed. The number of varieties listed on behalf of each grower will be restricted to twenty-five for the time being. The Department may inspect the crop producing the seed, and in all cases a sample of the seed must be sent to the Department of Agriculture with information as to the location of its production, and must be accompanied by the fee indicated above.

If any seed producer does not wish to pay the advertising charge he may submit his name with the variety of seed and sample to the Department, and if it is approved his name will be listed in the Department and information will be supplied regarding it to inquirers.

Cabbage—

Yates Select Succession, No. 64146—Arthur Yates & Co. Pty. Ltd., 184 Sussex-street, Sydney.

Yates Enkhuizen Glory—A. Yates & Co. Pty. Ltd., 184 Sussex-street, Sydney.

Cauliflower—

Shorts—H. Burton Bradley, Sherwood Farm, Moorland.

Cauliflower—continued.

Yates Phenomenal Early—Arthur Yates & Co. Pty. Ltd., 184 Sussex-street, Sydney.

Yates Phenomenal Five Months—Arthur Yates & Co. Pty. Ltd., 184 Sussex-street, Sydney.

Yates Phenomenal Main Crop—Arthur Yates & Co. Pty. Ltd., 184 Sussex-street, Sydney.

Hawkesbury Solid White—E. A. Sharp, 110 Gordon-avenue, Hamilton.

Phenomenal Five Months—E. A. Sharp, 110 Gordon-avenue, Hamilton.

Onions—

Extra Early Flat White—A. Yates & Co. Pty. Ltd., 184 Sussex-street, Sydney.

Hunter River Brown—A. Yates & Co. Pty. Ltd., 184 Sussex-street, Sydney.

Beet—

Yates Derwent Globe (Improved Crimson Globe)—A. Yates & Co. Pty. Ltd., 184 Sussex-street, Sydney.

Yates Early Wonder—A. Yates & Co. Pty. Ltd., 184 Sussex-street, Sydney.

Swede—

Yates Champion Purple Top—A. Yates & Co. Pty. Ltd., 184 Sussex-street, Sydney.

Varieties of Approved Seed Available.

IN order that farmers may be directed to what are regarded by the Department as the most satisfactory local sources of approved seed of recommended commercial varieties of farm crops and vegetables, the Department is willing to supply information concerning such sources of seed of the following varieties:—

Tomatoes—

Rouge de Marmande, Pearson.

Stock Losses in Transit.

Country Killing the Answer.

OF 300 pigs recently consigned from Wagga to Sydney, ninety-six were found to be dead on arrival at Homebush abattoirs, and five more died after unloading. The total loss was assessed at £700.

"It is obvious that if it had been necessary to transport these pigs for a short rail journey only, as it will be when country killing is in full swing, this loss would have been entirely avoided," said the Minister for Agricuture (Hon. E. H. Graham, M.L.A.) when referring to this occurrence.

Stockowners and others concerned, continued Mr. Graham, knew that mortality frequently occurred in connection with the rail transport of stock over long journeys, and that an appreciable number of animals were dead or had to be destroyed on arrival at Homebush. That applied to all types of animals—cattle, sheep and pigs. During the summer months the danger to pigs increased during temporary hot spells which occurred every year. The loss of the Wagga pigs emphasised one of the important factors which had encouraged the Government, said Mr. Graham, to proceed with the programme of increasing the facilities for the killing of live stock in the country. The four centres chosen—Dubbo, Goulburn, Gunnedah and Wagga—were widely distributed through the State and consequently the railage of stock over long distances would be considerably reduced if stockowners fully supported those country killing works.

The Importation of Queen Bees.

Difficulties to be Overcome.

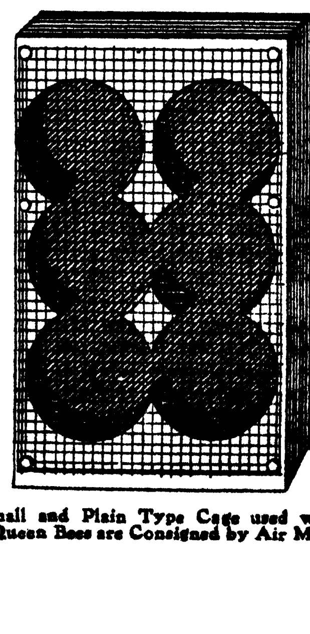
WITH the war over bee-farmers are becoming interested in the prospect of again importing queen bees from overseas. Some years have now elapsed since importations were possible, particularly from European countries. Only a few bees have come from the United States of America owing to the uncertainty of the air mail service, but this position will no doubt be improved in the near future. Another aspect which favours possible early importations from the United States of America is that more is known of the disease situation in regard to bees in that country than in the war ravaged European countries.

The Situation in Italy is Most Obscure.

The position in regard to possible importations from Italy is very obscure. No information is available as to the damage caused during the war to the bee-keeping industry in that country. The damage may be considerable and some time may elapse before bee-breeding work to cater for an export trade can be established on a satisfactory basis.

Then there is much anxiety concerning the possible spread of acarine disease during the hostilities, when little if any control could be exercised. It was known that the much dreaded acarine disease was present in northern Italy before the war, and the position will need to be clarified before there is a chance of securing importations from Italy.

Air mail services from Italy to Australia will require to be established on a sound and regular basis, if losses in mailing queen



Small and Plain Type Cage used when Queen Bees are Consigned by Air Mail.

bees are to be avoided, and care will need to be taken to ensure that the bees are not sprayed with D.D.T. or other insecticides at any time during transit.

Carniolan and Caucasian Queens.

The importation of Carniolan or Caucasian queen bees may also be difficult, as they come from European countries directly affected by the war, although the possible spread of acarine disease may not prove a cause for anxiety, as in the case of Italy.

It may thus be seen that some time must elapse before the position in regard to the possible importation of queen bees from European countries will be clear.

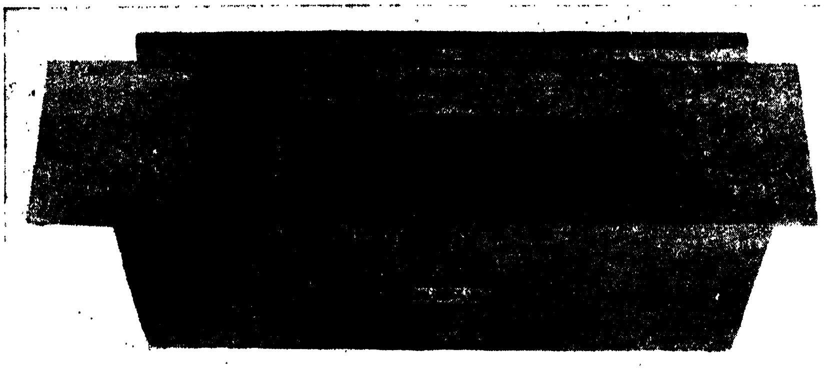
QUARANTINE REGULATIONS FOR BEES.

Any beekeeper who proposes to import queen bees from any country should first of all make a careful study of the Quarantine Regulations. These are as follows:—

"Queen bees and escort bees from any country shall not be landed unless they are consigned to the Chief Quarantine Officer and the following documents have been delivered to him:—

(a) a declaration by the owner stating:
1. that the bees are free from disease; and
2. that they are from an apiary that is free from disease; and

(b) a certificate by a Government Veterinary Surgeon or other officer whose duties relate to apiculture, in the country from which the bees are exported, certifying:
1. that the bees are from an area which is free from any disease affecting bees; and
2. that Isle of Wight disease (acariasis) does not exist in the country from which the bees are exported or that that disease does not exist in any apiary within twenty miles of the apiary in which the bees were kept."



The Large Cage used when Queen Bees were Shipped from Overseas.

A small comb for the queen and her escort to cluster on was inserted in the centre of the cage.

Feeding Bees

With Natural Pollen and Soybean Flour.

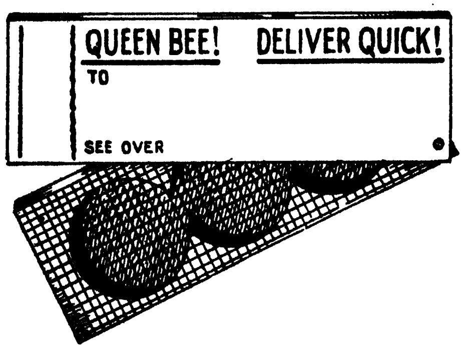
AN interesting article entitled "Food Reserves for Bees," by C. L. Farrar of the United States of America Department of Agriculture, was published in a recent issue of the American Bee Journal. It discusses the use of natural pollen mixed with soybean flour for feeding.

Specially manufactured pollen traps are used in the United States of America for collecting natural pollen. They are placed in the front of populous hives when pollen is being gathered in abundance and pollen is removed from the bees' legs as they pass through the traps. This pollen is stored and used with soybean flour when pollen is scarce.

The following few extracts from this informative article will be read with interest:—

"Feedings tests have shown that 1 lb. of pollen is required to rear approximately

4,500 bees. Normal colonies probably consume 40 to 50 lb. of pollen in a year. This represents 8 to 10 gallons of pollen pellets. The brood-rearing value of a given quantity of pollen can be increased six to eight times



Type of Mailing Cage used for Transport of Queen Bees when Released from Quarantine and Given a Fresh Escort before being sent to the Apiary in Australia.

by supplementing it with three times its weight of expeller-processed soybean flour. Thus, 1 lb. of pollen plus 3 lb. of flour will enable a colony to rear approximately 30,000 bees.

"The feeding of trapped pollen supplemented with soybean flour in cake form is a practical method for regulating colony development during the critical period of the season.

"The formula for the supplemented pollen cake consists of one part dry matter (one part pollen and three parts of expeller-processed soybean flour) and two parts sugar syrup (two parts sugar and one part of hot water).

"Dry pollen softens readily in water, but not in sugar syrup; therefore, the desired amount of pollen should be added to the water before dissolving the sugar. One cake would be prepared by adding 2 ounces of pollen to 5 ounces of water. Then stir in 10 ounces of sugar until dissolved or in suspension. Finally, add 6 ounces of soybean flour and mix thoroughly. Any number of 1½ lb. cakes can be prepared by using muliples of these values."

Sales of Useless Pest Destroyers Now Illegal.

IT is now illegal to sell any household or agricultural pest destroyer—insecticide, fungicide or weedicide—unless it is registered under the Pest Destroyers Act.

"Recent complaints regarding the ineffectiveness of alleged D.D.T. spray mixtures foisted on the public by unscrupulous manufacturers instance the need for the control which the Pest Destroyers Act gives over the sale and adulteration of insecticides, fungicides, and weed destroyers," said the Minister for Agriculture, Mr. Graham, recently.

"The Act aims to protect the interests of agriculturists, householders and reputable manufacturers, and although it came into force in September last, a period of grace was allowed wholesale dealers in these materials to comply with its requirements as regards registration, labelling, etc. Some hundreds of applications for registration have already been received by my Department," said Mr. Graham, "and a special Committee has been set up to deal with them. As soon as that work is completed the Act will be enforced rigorously. Registration of useless sprays and dusts will be refused."

The Act prescribes for annual registration by wholesale dealers of all pest destroyers they place on the market. Registration forms are available from the Department of Agriculture, and on them must be disclosed names and places of business of wholesale dealer and manufacturer, distinguishing name or "brand" of the pest destroyer, its active constituents, and directions for use. All destroyers offered for sale must bear a label setting out most of the particulars just mentioned, in addition to net weight or volume, and the words, "Registered under the Pest Destroyers Act, 1945 (New South Wales)".

Summer Time is Trouble Time in Dairying Districts.

CONTINUANCE of unfavourable weather conditions in dairying districts will make the lot of the dairy farmer difficult enough. Feed and water shortages quickly pull down production, and unless increased vigilance is exercised by dairy farmers in the matter of cleanliness they will find that these same unfavourable conditions will also adversely affect cream quality.

The Division of Dairying of the Department of Agriculture directs particular attention to the need for careful cleansing and scalding of all dairy utensils, aerating and cooling of cream, and to the importance of frequent delivery to factories and depots. The Department's Dairy Instructor in your district is there to help you in these matters, or you may write to the Department's Head Office, Box 36A, G.P.O., Sydney, for free leaflets on the avoidance and control of defects in milk and cream, and on the cleansing and care of milking machines.

INSECT PESTS.

Notes contributed by the Entomological branch

The Fruit-tree Moth Borer (*Cryptophasa unipunctata.*)

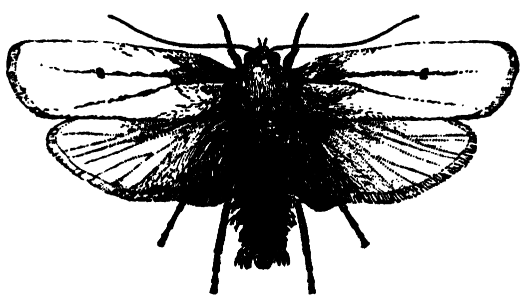
DAMAGE has been caused to various fruit trees in a number of districts by the caterpillars of the fruit-tree moth borer, the trees most affected being peaches, nectarines and plums. This insect is the most frequently noticed borer infesting fruit trees, on account of the conspicuous brown mass of gnawed wood and excrement with which the larva covers the tunnel opening in the tree.

The caterpillars of this moth under natural conditions commonly infest the black wattle (*Acacia decurrens*), but for many years, in addition to the orchard trees mentioned above, have also been recorded attacking apricots, cherries and prunes. Other trees have been recorded as hosts for the caterpillars of this moth, but it is possible that these records refer to other members of the family (*Xyloryctidae*), which, in Australia, contains more than two hundred and fifty species.

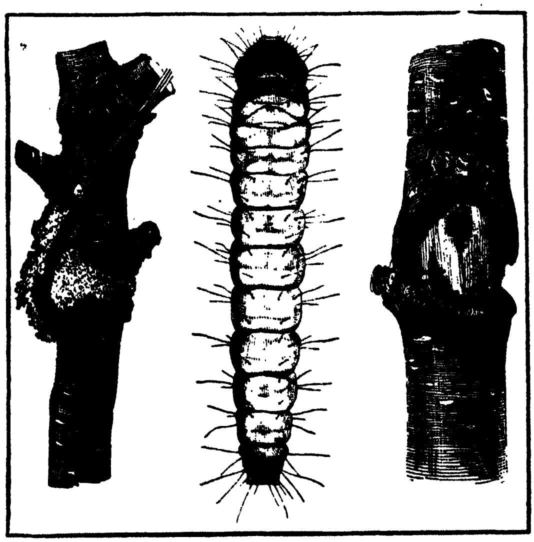
The adult moths, which measure from about 1½ to 2½ inches across their outspread wings, are satiny-white. The upper surface of the abdomen is black, with an orange-coloured fringe of hairs and a thick tuft at the tip. There is a small black spot near the centre of each of the forewings.

The eggs are deposited on the surface of the bark, and the small caterpillars, on hatching, commence to feed on the bark and bore downwards into the tree. The tunnel is enlarged as the caterpillar grows, until finally by the time the caterpillar is fully-fed, it is 4 or more inches in depth. The tunnels, usually, are made in the forks of the trees or between the main branches, but where small trees with upright limbs are infested, continued bark feeding may lead to ring-barking. During the day the caterpillar hides in the tunnel, but at night it comes out to feed upon the bark surrounding the tunnel opening. The damaged bark is always covered with a mass of gnawed wood and excrement, webbed together with fine silken strands.

When fully-fed, the reddish-brown caterpillar, which may then measure about 1½



Adult of Common Fruit-tree Moth Borer.



Left.—Branch Showing Webbed Material Covering Tunnel Entrance.

Centre.—Caterpillar of the Common Fruit-tree Moth Borer.

Right.—Webbed Material Removed to Show Tunnel Entrance and Damage to the Bark.

inches in length, closes the tunnel entrance with a wad of silken web and chewed wood, and changes into a chrysalis or pupa, from which, later, the adult moth emerges.

Control.

Remove the mass of webbed material from the bark to expose the opening to the tunnel and then insert a piece of pliable wire and twist it around to kill the caterpillar within.

Another method is to inject a few drops of kerosene into the tunnel to cause the caterpillar to crawl out, when it can be destroyed. Fumigation with carbon bisulphide by injecting a few drops of the liquid into the tunnel and then plugging the entrance is also effective in controlling the caterpillars. If either of the two latter methods is adopted, care should be taken to ensure that only a very small amount of the liquid is used or further injury may be caused to the tree.

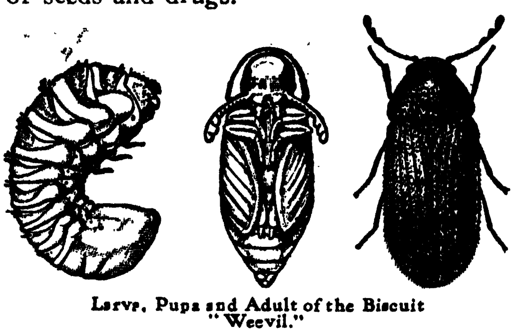
After treatment the tunnel opening should be plugged with grafting wax or other suitable substance to prevent decay and the entry of other secondary insects which may add further to the damage. The exposed wood surfaces should then be painted over.

Two Beetle Pests (*Ptinidae*) of Stored Foodstuffs.

NUMBERS of reports of beetles infesting dwellings have been received recently, and these insects, on examination, have frequently proved to be either the common biscuit "weevil" or drug store beetle, *Sitodrepa panicea,* **or else the tobacco beetle,** *Lasioderma serricorne,* **and a search by the occupants amongst materials stored in cupboards or on shelves in pantries, etc., has usually revealed the source from which the invasion of these insects arose.**

THE BISCUIT "WEEVIL."

This beetle, often popularly referred to as a "weevil," infests various foodstuffs, including flour, breakfast foods, cayenne pepper, ginger, biscuits, chocolate, almonds and other nuts, dried fruits, etc. Where it infests stores it may destroy various kinds of seeds and drugs.



Larva, Pupa and Adult of the Biscuit "Weevil."

[After Chittenden.

It is often mistaken by householders for the furniture beetle or "wood borer," *Anobium punctatum,* which it closely resembles, and in which family of beetles, the *Ptinidae,* it is also included.

The adult beetle, which measures about 1/10th inch in length, is of a uniform light-brown colour and is capable of flying. When at rest its head is withdrawn into the hood-like thorax.

The eggs are laid amongst the food of the beetles, and the curved, cylindrical grubs or larvae, which hatch from these eggs, are white with darker mouth parts. They tunnel through their food, and when fully-fed enter their chrysalis or pupal stage within a small rounded cell which is composed largely of powdered food substances. The life-cycle, during the summer, from egg to adult occupies about two months.

Control.

Cleanliness where foodstuffs are stored or prepared is essential. All accumulations of rubbish and waste products should be kept off floors, benches, etc., as all such materials left lying about may serve as breeding grounds for various insects. Insects will usually thrive where there is sufficient warmth, moisture and food.

Where products liable to infestation are packed in sealed containers which prevent the entry of adult insects, the stored materials will remain uninfested indefinitely. Products can only become insect infested by adults laying their eggs on or amongst them or by larvae crawling from adjacent infested materials. Foodstuffs with a low moisture content are less liable to attack by insects.

All materials should be inspected before being stored, and if found to be infested with insects, should either be fumigated or heated. Inspections should also be made at intervals during storage, particularly where substances liable to infestation are likely to be held for long periods.

Where fumigation is necessary carbon bisulphide may be used, and if only small quantities of materials are to be fumigated, this may be done in airtight drums or barrels or other airtight containers. Carbon bisulphide is used at the rate of 4 ounces, by weight, to 50 cubic feet (5 lb., or approximately 3 1/5th pints, to 1,000 cubic feet) of air space, and the liquid is poured into a shallow vessel placed on top of the materials. The container is then sealed and the gas allowed to act for twenty-four hours or longer.

Where seeds have to be fumigated, and are required later for growing purposes, they should not be fumigated for more than twenty-four hours, or the germination may be affected. After fumigation, the substances or seeds should be spread out on an insect-free surface to dispel the fumes.

WARNING: Carbon bisulphide is highly inflammable and explosive, therefore no light of any description (pipes, cigarettes, fires or embers, radiators, stoves, etc.) must be allowed in or near sheds or buildings during the process of fumigation with this gas. The precaution should also be taken to cut off the electric current. Even hot steam pipes have been known to cause explosion of this gas, so that any such pipes should be allowed to cool before proceeding with fumigation.

To overcome the danger of using carbon bisulphide alone, non-inflammable carbon bisulphide mixtures, and mixtures of ethylene oxide and carbon dioxide, or ethylene dichloride and carbon tetrachloride are sometimes used.

Ethyl formate, a volatile liquid, is largely used as a fumigant for dried fruits in packing sheds. It is used after packing, immediately before nailing the lid on, and where the fruit is stored, subsequent applications of this liquid are made every two months. Ethyl formate is used at the rate of 1/3rd to ½ fluid ounce (10 to 14 c.cs.) to each 56 lb. box and less (7 to 8 c.cs.) for 56 lb. tins.

This treatment does not harm the fruit or affect its flavour, and where boxes without linings are used the fumigant evaporates within a few hours. The vapour in tins, also disappears, but more slowly, and as a result of chemical changes, becomes formic acid and ethyl alcohol, which in the concentrations present are quite harmless.

WARNING: Ethyl formate is highly inflammable and care must be taken in handling it.

Where heat is used, a temperature of 120 to 130 deg. Fahr. is fatal to all insects

Larva, Pupa and Adult of the Tobacco Beetle.
[*After Chittenden.*

in a few hours, and a temperature of 140 deg. Fahr. for 10 minutes will kill all grain-infesting insects that are actually exposed to it.

Probably, for the average householder, who usually has only a small quantity of stored foodstuff that requires treatment, spreading the material out on a tray and heating it in an oven will be found the easiest and most convenient method of controlling the pests.

Cold storage at a temperature of 40 to 42 deg. Fahr. will prevent injury by insects.

THE TOBACCO BEETLE.

This beetle superficially resembles the Biscuit "Weevil," but is slightly smaller, and in its grub or larval stage is more wrinkled and hairy.

Although it is considered to be primarily a pest of tobacco, it commonly infests various stored foodstuffs in a similar manner to biscuit "weevil" and its life-cycle and habits are similar.

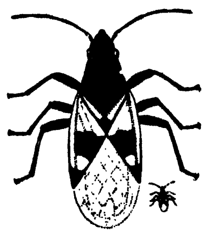
The control measures recommended for the biscuit "weevil" are also effective against this pest.

The Coon Bug (*Oxycarenus arctatus.*)

DURING the present season these small bugs have been abundant in many districts, and have been found infesting cultivated plants. In most seasons this native species of bug feeds and develops amongst weeds and native plants, but when present in numbers they are capable of causing appreciable injury to various orchard fruits such as apricots, peaches, plums, etc.

Infestations in cultivation areas usually occur in dry seasons when there is lack of other green herbage.

Where orchard trees are infested the bugs usually cluster mainly on the fruits around the stalks or beneath leaves which are in contact with the fruit, and where figs are infested the leaves become curled and the bugs cluster within. Ornamental garden plants may also be attacked.



Adult of the Coon Bug.

These bugs feed by piercing the plant tissues and sucking up the sap, and they increase in size by a series of moults until they reach the winged, adult stage. The immature forms of the bugs usually attract attention from observers, as they are blood-red in colour marked with black.

The adult bug, which measures about ⅛ inch in length, is marked with black and white. The elongate, whitish eggs, which measure about one twenty-fifth inch in length, are deposited on various plants and on marshmallows (*Malva* sp.) are laid under the sepals enclosing the seeds, and on the leaves.

No insecticide at present available will readily control these bugs. Dusting the plants with a 2½ per cent. nicotine dust will repel the bugs and the residue of lime left on the plants, although unsightly, acts as a temporary deterrent.

Pyrethrum is not available at present, but it may be mentioned that a dust consisting of a mixture of equal parts of pyrethrum powder and 2½ per cent. nicotine dust has given good results in controlling these bugs, and that a kerosene emulsion incorporating pyrethrum extract is effective as a spray.

Recent experiments for the control of the Rutherglen bug (*Nysius vinitor*), a species with somewhat similar habits, have demonstrated that a dust containing 2 per cent. D.D.T. under laboratory conditions killed the bugs in eight hours, and that under field conditions, plants dusted with the 2 per cent. mixture were rendered repellent to the bugs for at least two days. It is possible that this dust may also have the same repellence for the coon bug, but no recommendation for the use of this dust can yet be made, as its action upon plant growth and man is not yet fully understood.

Agricultural Societies' Shows.

SECRETARIES are invited to forward for insertion in this list dates of their forthcoming shows; these should reach the Editor, Department of Agriculture, Box 36A, G.P.O., Sydney, not later than the 15th of the month previous to issue. Alterations of dates should be notified at once.

1946.

Albion Park	January 19
Moruya	February 13, 14
Pambula	February 15, 16
Newcastle (P. G. Legoe)	February 20, 21, 22, 23
Dorrigo and Guy Fawkes (C. C. Dean)	February 21, 22
Candelo	February 22, 23
Tenterfield	February 26, 27, 28
Bega	February 28, March 1, 2
West Maitland (Montie Brown)	February 28, March 1, 2
Queanbeyan (D. Vest)	March 1, 2
Moss Vale (A. E. Summers)	March 1, 2
Tumut (T. E. Wilkinson)	March 5, 6
Jingellic (R. Langshaw)	March 6
Cobargo	March 6, 7
Cooma	March 6, 7
Taralga (L. Alders)	March 7, 8
Tumbarumba (Violet O'Shea)	March 12, 13
Bombala	March 13, 14
Delegate	March 20, 21
Yass (H. B. Robertson)	April 4, 5
Gloucester (R. S. Wilson)	April 9, 10
Muswelbrook (T. B. Haydon)	April 11, 12
Narrandera (T. L. Bull)	September 13, 14

SANITATION ON THE POULTRY FARM

Its Value in Disease Control.

Methods of Disinfection and Fumigation.

L. HART, B.V.Sc., H.D.A., Veterinary Research Officer.

IN the management of his farm, the poultry keeper should employ all those measures which tend to promote health and prevent disease. All these practices are grouped under the term "sanitation." The observance of the rules of sanitation on the poultry farm will assist considerably in the control of many diseases, and although in some infectious diseases its value is limited, sanitation, which includes the removal of infective material or rendering it harmless, can play an important part in reducing losses.

Cleanliness.

Cleanliness is the main weapon in the control of some diseases. The prompt removal of all droppings and soiled litter is most important in reducing the losses caused by coccidiosis and blackhead. Coccidiosis is spread by means of the droppings. The coccidia, which are passed by an infected chicken, require at least forty-eight hours to segment before they become infective. The prevention of contact with the droppings by their early removal will prevent the spread of the infection. This is not possible in practice, but thorough cleaning of brooder, runs and utensils, at least once daily, will minimise the danger. The coccidia, being microscopic in size will not all be removed, but heavy infection will be prevented. In blackhead, sanitation is the only weapon.

Rearing chickens on wire netting screens which permit the droppings to fall on to the floor below, will prevent infection with coccidiosis and blackhead.

Disinfection.

Disinfection (the destruction of disease germs) may be attempted in a variety of ways:—

(*a*) Addition of chemicals to the drinking water.

(*b*) The application of heat.

(*c*) The application of disinfectant solutions.

(*d*) Fumigation.

No matter what method is employed, it is essential that before attempting to disinfect an object, it should be thoroughly cleansed mechanically. If dirt is present, the object may be soaked with disinfectant, then cleansed and again disinfected.

(*a*) *Disinfection of Drinking Water.*—This is of little value except in coccidiosis. When outbreaks of disease occur in a poultry flock, farmers often add some chemical to the drinking water, in the hope of treating the disease or preventing its spread. Apart from some drugs which are specific against coccidiosis, such a *practice is almost worthless.* If the drugs are added in sufficient amount to be disinfectant, they are usually poisonous to the fowls. Others, such as condy's crystals, are rapidly rendered inactive by contact with organic matter.

(*b*) *Disinfection by Heat.*—This may be attempted by naked flame, using so-called fire guns or blow-lamps, or by hot water. Although the fire gun looks spectacular, tests have shown that it is extremely difficult to disinfect by this means. To ensure elimination of all coccidia on a floor of one hundred square feet area would take several hours with a fire-gun.

Boiling water is a good disinfectant, and the addition of 1 lb. of caustic soda to each 5 gallons of water gives improved results. Drinking vessels and feed troughs may be sterilised by boiling for a few minutes in such a solution, but should be washed in clean water again before use.

(*c*) *Disinfectant Solutions.* — Certain chemicals have disinfectant properties, and the application of these, usually in solution in water, is a reliable method of disinfection. Probably the cheapest of these are what are known as coal tar disinfectants

such as cyllin, phenol and lysol. These are mainly sold as proprietary lines, and the directions of the makers should be followed.

(*d*) *Disinfection by Fumigation.*—Fumigation is an essential operation in the hygienic management of incubators, and formaldehyde gas is the most satisfactory substance to use. It should be carried out between hatches, and also whilst the eggs are in the incubator, but whenever it is done, the incubator should be "running" and the humidity in it should be high, preferably over 65 per cent.

Excessive amounts of formaldehyde will have a deleterious effect on hatchability if the embryoes are less than three days old, and also may produce harmful results in chickens when they have commenced to hatch. For these reasons it is desirable not to fumigate before the third day nor after the eighteenth day of incubation. Two or more fumigations may be carried out during the period of incubation without detrimental results, but it is best to give the final fumigation as close to hatching time as possible. Where hatching takes place in a special chamber or separate machine, the eggs may be fumigated in this machine or chamber, or the hatcher may be fumigated whilst empty and the fumigated eggs then transferred.

Methods of Fumigation.

Incubator fumigation may be carried out by two methods:—

1. The cheesecloth method.

2. The potassium permanganate (condy's crystals) method.

The methods are equally efficient.

Cheesecloth Method.—This method uses less formalin, but is unpleasant to use unless rubber gloves are available, as the formalin is likely to get on to the hands when manipulating the cheesecloth, and will harden and crack them. The amount of formalin to use is based on the internal volume of the incubator, 16 to 25 ml. (cc.) of formalin being used for every 100 cubic feet of space.

The formalin is poured on to sufficient cheesecloth to absorb it without dripping. This cheesecloth is then placed in a direct air current inside the machine—in forced draught machines this is in front of the air inlet. Do not exceed 25 ml. of formalin per 100 cubic feet.

Potassium Permanganate Method.—A supply of formalin and potassium permanganate, two 10 cc. graduated glass cylinders, small beakers such as breakfast cups or larger earthenware pots, depending on the size of the incubator to be fumigated, are required. Cups are suitable when the space to be fumigated is less than 10 cubic feet.

Owing to the fact that when formalin and potassium permanganate are mixed, vigorous frothing with the generation of heat and the liberation of gas occurs, a sufficiently large and strong earthenware, pyrex glass, or china vessel should be used to avoid overflowing of the materials and cracking of the container. Do not use a flat vessel, such as a saucer, as some of the formalin may run to one side, and complete interaction of the two substances will not take place.

(*a*) QUANTITIES TO USE.—The amounts stated below should be strictly adhered to, as an overdose may affect the development of the eggs.

First it is necessary to calculate, in cubic feet, the capacity of the incubator, by multiplying together the inside measurements of length, breadth, and height. No deduction is made for space taken up by inside fittings, eggs, etc. In the small, still-air incubators, 0·35 cubic centimetres of formalin and 0·175 grams of potassium permanganate are required for each cubic foot capacity. In the large, forced-draught machines, these amounts are increased to 0·4 cc. formalin and 0·2 grams potassium permanganate per cubic foot of space to be incubated.

As an example, take an incubator with the following dimensions:—Length, 4 feet; width 3 feet; depth, 1 foot 3 inches.

The cubic capacity $4' \times 3' \times 1'\ 3'' = 15$ cubic feet.

The amounts of materials to use are arrived at as follows:—
$0·35 \times 15 = 5·25$ cc. formalin.
$0·175 \times 15 = 2·625$ grams potassium permanganate.

The formalin is measured in one of the measuring cylinders. When the amount of potassium permanganate required has been calculated, ask your chemist to weigh it out.

Before using it, transfer it to one of the glass cylinders and note and record the height. As the same amount will be required on future occasions, this second glass cylinder (which must be dry) will serve as a means of arriving at a reasonably accurate estimation of the potassium permanganate required. A slight excess of potassium permanganate will do no harm.

(*b*) HOW TO FUMIGATE.—The calculated amount of potassium permanganate is placed in a clean vessel. A small quantity of formalin is poured into a beaker, and from here is poured into the measuring cylinder up to the required amount—the beaker facilitates the measurement. The door of the incubator is opened, the formalin added to the potassium permanganate and the vessel containing both ingredients immediately placed on a previously prepared position in the incubator and the door closed. It is not necessary to block up the ventilation ports of the machine whilst fumigation is in progress. The material may be removed from the incubator after 15 minutes and the incubator closed and run in the normal manner or it may be left in and removed at some convenient time.

When taken from the incubator a slightly moist, charry mass should remain in the bottom of the vessel. If this material is bone dry, it indicates that an excess of potassium permanganate has been used (a good fault), while, if any appreciable amount of fluid is still present, too little potassium permanganate has been used.

Important Points in Fumigation.

Fumigation is safe and effective—make it a routine practice. Aim at giving the final fumigation on the eighteenth day of incubation. Keep the stock formalin bottle tightly stoppered. When fumigating have the incubator humidity high—65 per cent. or more.

Incubator Hygiene.

Disease germs may gain entrance to an incubator on the surface of eggs, inside eggs (e.g. pullorum disease) or with the air being drawn into the machine. If the incubator is not disinfected between hatches, an infection of one hatch may infect the succeeding hatch. After a hatch has been taken off, the incubator should be thoroughly cleaned, preferably using a vacuum cleaner to remove all fluff and dust. The machine should be washed out with a soapy disinfectant solution, and then fumigated.

Care should be taken to remove dust from the top and sides of the incubator, and the incubator room should be kept spotlessly clean and should be disinfected periodically. It is impossible to have a clean incubator in a dirty incubator room.

These measures will prevent a hatch contracting pullorum disease from a previous hatch, and will reduce the possibility of navel infection.

Disinfection of Houses and Yards.

An outbreak of pullorum disease in a brooder house will necessitate disinfection, after removal of infected stock, and before new hatches of chickens are introduced. Also, when adult "carriers" of pullorum disease are removed after testing, or an outbreak of fowl cholera occurs, the houses, feeding and drinking troughs should be disinfected, all rubbish removed from the yards and all moist or shaded areas in the yards disinfected.

Disinfection of houses is best carried out by first removing all manure and dirt, and then washing out with a hot 2 per cent. solution (1 lb. to 5 gallons water) of caustic soda. A coal tar disinfectant mixed according to maker's directions should then be applied. A stirrup pump is a good means of applying the disinfectant.

The disinfection of yards is difficult. Removal and burning of all surface rubbish and exposure of the yard to sunlight is the most practical means of disinfection. The spreading of lime over the surface of the soil is of very doubtful value as a means of disinfection.

One method recommended by the United States Deparment of Agriculture is to wet the soil thoroughly with a solution made by dissolving 1 lb. caustic soda and 2½ lb. water-slaked lime in 5½ gallons of water. From ½ to 1 gallon of this solution should be used per square yard of soil surface depending upon the absorbent quality of the ground. The cost is comparatively low. Care should be taken in its use as it will burn the hands. Feed and water troughs should be washed subsequently in clean water before use.

The Breaking, Training and Handling of Horses.

Methods Described and Illustrated.

(*Continued from vol. 56, page 488.*)

T. G. HUNGERFORD, B.V.Sc., H.D.A.

IN the four instalments which have appeared since the article commenced in May issue, the author has discussed the "breaking" of draught, saddle, waggon, and sulky horses by various methods, as well as the training of saddle horses and the handling and working of broken horses.

In this month's continuation further points in general management are given.

Points in General Management.

Amount of Work.

Young and newly-broken horses should never be over-fatigued by long hours of heavy work, or their "willingness" will be broken. Similarly a willing horse when first brought in from grass must be hardened off gradually. Such horses will frequently work, if allowed to, until the muscles of their hindquarters quiver and tremble. Such thoughtless treatment is cruel, and may lead to attacks of colic and occasionally to loss of the horse.

A severely over-worked horse may develop "founder," after which he is never the same in effectiveness.

Turning-out at Night.

When horses are brought in late in the evening lathered with sweat, they should be scraped down with a sweat scraper—a piece of hoop iron 2 feet long serves splendidly. If this is omitted in the summer when the night is warm or sultry, no harm will occur, but in winter a long coat may remain wet almost through the night and the portion under the belly dries last. This results in chilling of the belly and impairs normal digestion—and in some horses leads to attacks of colic.

Washing Down.

In England this practice is generally condemned, and in parts of New South Wales where English type of climate prevails (*e.g.*, tablelands) the practice is undesirable. Generally speaking the practice should not be carried out as routine in winter months in New South Wales.

On most Australian farms, horses are never groomed from birth to death except for some gala occasion. Under such conditions if ample water is available, a horse which is lathered and dripping with sweat, and which is covered with dirt and mud on the legs and body (after, say, ploughing) will benefit from hosing down. After hosing all excess water can be squeezed off in a few moments with a sweat scraper.

Hosing should never be carried out if conditions are such that the horse will not dry within half an hour. If the horses are kept in stables (rare under New South Wales farming conditions) they may not dry and washing is then harmful. Horses with light feather (Percheron and Suffolk Punch) dry out more quickly on the legs than the Clydesdale.

For the most part water is not available for hosing horses in New South Wales, and it is surprising how well most working horses contrive to keep their skin without any washing or grooming year in and year out.

Washing horses for show is best carried out with warm soft water and some soapy preparation, after which the animal is thoroughly washed with pure water, and rubbed

down. The final rubbings may be made with a clean soft cloth just "moistened" with cocoanut oil—only a trace of oil to be used or the dust adheres.

All the dangers of washing horses are due to the failure to dry, and horses left wet on the legs and belly are often affected with stiffness, and cracking (or chapping) of the skin, and by attacks of colic. Wetness around the fetlock may lead to skin inflammation and "greasy" heels, and where such cases are occurring washing should be abandoned entirely.

Apart from special purposes such as for show preparation, no soap should be used on the horse as it leads to depletion of the natural grease, loss of the "sheen," and a certain amount of loss of protection against rain and cold.

Clipping Horses.

The winter coat of horses kept under open paddock conditions is very long and dense, and when ploughing, etc., during the day they become saturated with sweat. This distresses the horse considerably, and diminishes his effective output of work. Further, unless care is taken to "sweat-scrape" him at night, the chilling effect of the sweat on his wet coat operates through some of the night.

For these reasons it is economical to obtain rugs for working horses and then to clip them completely. If there is some fear that the rug may be left off occasionally, then only clip the horse up to the level of the point of his shoulder and stifle, *i.e.*, "trace high."

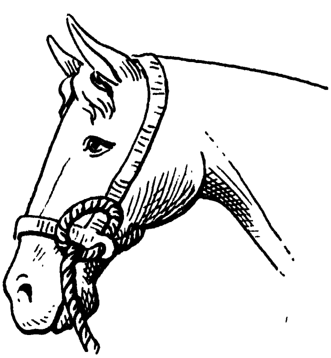


Fig. 24.—Webbing Halter with Cinch to Prevent Tightening or Loosening when Horse is Tied.
[*After Miller and Robertson.*

A clipping machine that provides for an assistant turning by hand is often used. Electric clippers are, of course, ideal.

Some horses object strongly to clipping. Placing a single sideline on (as described in a later section of this article) and lifting one hind foot off the ground will soon make the touchiest horse submit. He tires of prancing round on three legs and perhaps throwing himself if he is a "willing" objector.

Grooming Horses.

Horses in agricultural areas are seldom groomed, but they get rid of the caked sweat and dirt by vigorous rolling in loose earth, sand, or grass—horses run under such semi-natural conditions usually do quite well, although grooming would be a decided advantage from the horse's health and efficiency standpoint. It is not suggested that grooming of agricultural horses would be a paying proposition in this State. Horses kept in city stables, racehorses, carriage horses, and saddle hacks are in a different category and such animals usually receive efficient grooming. Army horses are also effectively groomed, and under army conditions this is a necessity for the maintenance of health and efficiency.

Objects of Grooming—

(1) To remove skin secretion, scurf, dirt and loose hair. Sebaceous (grease) and sweat glands pour their secretions into the skin, and the outside layer of the skin comprises dead cells which are continually flaking off in the form of scurf. Vigorous grooming sweeps away all such materials.

(2) To massage the skin and underlying tissues. Vigorous grooming plays the same

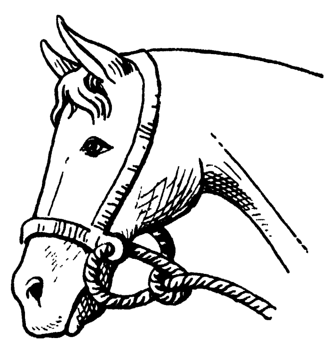


Fig. 25.—Another Method of "Chocking" the Halter when the Horse is Tied-up.

part in training of racehorses as massage does in the case of an athlete. It promotes free blood flow to the skin, subcutaneous tissues, and underlying muscles.

(3) To prevent skin diseases. By promoting a healthy skin condition, predisposition to skin disease is removed. Should infectious skin conditions, such as mange or ringworm develop, the very greatest care should be taken to avoid the spread of these, and such cases should be rigidly isolated and any grooming instruments used should be steeped in boiling water before use on healthy animals.

(4) To improve the appearance of the horse.

Equipment Used in Grooming.

Dandy Brush.—A brush about 10 inches long by 3½ inches wide with long (3 to 4 inches) vegetable fibres. For rapid grooming, *e.g.*, for the rough grooming sometimes given on the farm, this brush is best. With rapid vigorous sweeping strokes in the direction of the hair, the skin debris may be rapidly removed and the skin vigorously massaged.

Body Brush.—This is a flat oval brush about 9 or 10 inches long by 5 or 6 inches wide, with animal bristles about 1 to 1½ inches long. The brush usually has a band of webbing over the back to keep the hand in place on it. It is a softer brush than the dandy, and leaves a fine, smooth, glossy appearance when used vigorously.

The Curry Comb is used for removing caked mud from the coat and for cleaning the dirt out of the dandy and body brushes. The caked dirt may be removed almost as well by the wooden back of the dandy brush in the absence of a curry comb.

Sweat Scrapers are made from flexible metal such as a piece of hoop iron, about 2 feet long, and are best fitted with a handle at each end. These are very valuable for scraping down a horse lathered with sweat, or after washing.

Other Grooming Equipment is used regularly in racing stables, in the army, some city stables and with horses at the stud. Some of these are:—

Washing cloths for washing out smegna from the sheath, in the case of stallions and geldings.

Wisps of hay or straw made into a pad about 6 inches wide, 2 inches thick and 1 foot long are used for massage of the horse.

Rubbers (pieces of soft cloth) may be used for giving a good finish to the coat.

Water brushes (for head and for washing feet), sponges (for eyes, nose, etc.) may also be used.

Massage by hand rubbing is carried out by trainers of horses for races.

Method of Grooming.—

The person grooming should stand well away from the horse, and with a stiff arm he should lean on the brush as it is swept along in the direction of the hairs. For thorough cleansing of the horse's coat and effective massage, hearty grooming for an hour may suffice. To tell whether the horse's skin is clean, brush the hairs backwards, *i.e.*, in the reverse direction to that in which they lie, and examine the amount of dirt and scurf on the skin.

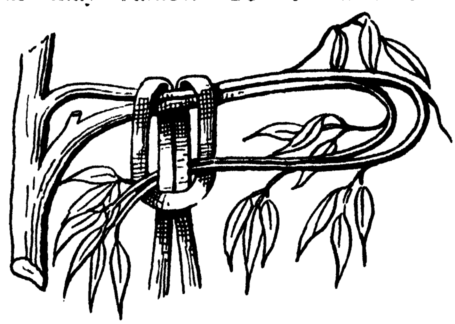


Fig. 26.—Diagram showing Army Method of Tying the Reins to a Branch or Twig.

Points in Driving.

The novice should be careful to use the reins as lightly as possible; harsh use will rapidly "spoil" a horse's mouth. Common faults are jagging at the reins to make the horse go faster, and indefinite commands and indications to the horse, which tend to make it unlearn its habits of obedience.

A horse's mouth, particularly if young or partly, or newly broken, may be spoiled by severe bits, by too tight reining, and by poor driving.

To Pass Through a Gate with Restive Horses.

This presents quite a difficulty. With a sulky, van, or dray where the horse is likely to run off the moment you leave the vehicle to close the gate, it may be possible to turn the horse and vehicle round after passing

through the gate. The track may not, however, be wide enough for this. If the reins are tied in a loop of the correct length to leave slight tension on the horse's mouth, and then placed over the hub of the right or offside wheel, any forward movement of the horse will then wheel him round to the right or towards you.

To Leave a Horse and Vehicle.

To leave a horse and vehicle in an open space where the horse cannot be tied up, a strap or rope should be placed round the right or off side wheel (round the rim) and secured to some adjacent part of the vehicle such as the shaft. Then the reins should be tied on to one of the lower spokes on the front of the wheel about a foot from the ground, at such a tension that, as the horse attempts to walk forward, the turning of the spoke causes definite tension on the reins before the movement of the wheel is stopped by the rope or strap. The reins should not be tied to the wheel spoke without a strap or rope on the wheel, as in this case, when the horse goes forward, the reins pull him hard, he backs vigorously and may not stop until the turning of the wheel turning in the other direction again drags on his mouth, and the more he backs the harder the reins pull. The author has seen a quiet draught horse so tied, which dragged himself over backwards in a dray, smashed the shafts, and broke the harness. With the wheel tied and the reins attached to the lower spokes, if the horse backs then the strap or rope stons the wheel turning before any back pressure comes on the reins.

To Tie-up a Horse.

The best method is to use a halter tied with a cinch or chock, or a rope tie round the neck in a knot which cannot slip, such as a bowline, with the free end of the rope tied up so short that the horse cannot get his foot over it and so cast himself (see Figs. 24 and 25).

Where a saddle hack or harness horse is being tied up by the leather reins, they should be attached to some non-solid thing on the fence, such as a small wire hook from some free end of wire. If the horse pulls back the hook gives and saves breakage of the reins.

A horse may be tied by the reins to a branch or twig, as illustrated in Fig 26. taken from a diagram in the Army Manual.

Where horses will not tie up, but persist in pulling away, tie up with an unbreakable halter and allow him to pull until he finds that escape is impossible. If this does not cure, run a rope crupper under the tail, tie both sides together over the loin, run forward on either side of the neck to the tying post. On pulling back the horse takes pressure on the rope crupper. The front end may, if desired, be run through a ring and then to the head stall so that pulling back brings pressure on the tail as well as the head.

Where this does not work, run a rope around the neck, tie with a bowline and then take the free end, and half hitch it round the lower jaw, placing the rope that goes through the mouth *under* the tongue. If placed over the tongue the latter may be cut off or nearly so. This is McGillivray's

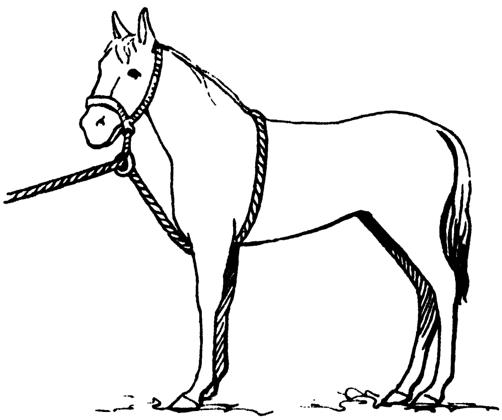


Fig. 27.—Method of Tying a Horse that Persists in Pulling Away.

The rope is passed through a ring on the head stall, between the front legs and secured round the chest with a slip knot.

method, and horses that will not refrain from dragging may be tied like this until they abandon their bad habit.

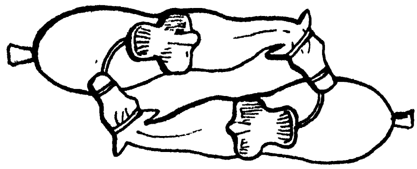


Fig. 28.—Horses Tied Nose to Saddle.
A method that keeps them in the one place.

It is also claimed that with this method of attaching a rope, giving the command to go forward and then drawing strongly on the rope, will induce the most stubborn "jib" to move into draft, when all other methods fail.

Another method of tying is to take a stout rope, run it through a ring on the head stall, back and down between the legs, then around the chest and secure with a slip knot. As the colt pulls back the rope tightens around his chest. This device may also be used for teaching to lead (see Fig. 27).

To Secure Horses in the Open.

A correctly broken horse will not stray away if the reins are simply thrown on the ground. Most stock horses are broken in this way, as already described.

Hobbling.—Hobble straps may be passed round each front pastern and buckled through links of a chain which is 6 inches long. Another method is to tie a rope or leather thong above the knees so that one leg cannot be placed in front of the other. Touchy horses may strongly resent this.

Drawing the head to the near side by tying the reins short to the girth or to the stirrup will make most horses walk in a circle and so prevent straying.

Two horses may be coupled together, as shown in Fig. 28, allowing only 6 inches of rein between the bit and the D for the crupper.

(*To be continued.*)

Temporary Pastures in the Wheat Rotation.

(*Continued from page* 2)

and clover seeds mixture on a correctly graded and well prepared seed bed, and not with a crop of wheat.

Suitable temporary pasture mixtures for irrigated country would be:—

A. Where the amount of water is limited in quantity:—Wimmera Rye 2 lb., lucerne 2 lb., and Subterranean clover (mid-season strain) 2 lb. per acre.

B. In areas where the water supplies are plentiful:—Italian Rye 2 lb., Wimmera Rye 2 lb., Perennial Rye 4 lb., Red clover 2 lb., Subterranean clover (mid-season strain) 2 lb., lucerne 2 lb. per acre. On shallow soils having impervious subsoils close to the surface, omit lucerne from the mixture.

General Notes.

Owing to the large amount of "hard" seed in Ball and Burr clovers, only scarified seed of these species should be planted.

One of the disadvantages of sowing lucerne with wheat, is that if the spring and early summer months turn in very dry, this legume is unlikely to become established satisfactorily when sown with a cover crop.

In heavier rainfall districts and under irrigation, other grasses and clovers such as *Phalaris tuberosa*, Perennial Rye, White clover, are suitable for the establishment of permanent pastures; these species, however, are too valuable to include in the wheat rotation as they would be approaching their maximum carrying capacity when wheat was to be planted again.

Any farmer requiring details of suitable permanent pasture mixtures for his country should write to this Department for recommendations.

Further details covering pasture improvement operations will be found in the following publications which can be obtained, free of cost, from the Department of Agriculture, Sydney:—

Pasture Improvement in Northern Tableland Districts.

Pasture Improvements in Central and Southern Tableland Districts.

Pasture Improvement in the Slopes, Plains and Western Division.

Lucerne as Pasture in Western Districts.

Methods of Establishing Improved Pastures.

Methods and Machinery for Top-dressing Pastures.

Pasture Management.

Pasture Improvement on the Murrumbidgee Irrigation Area.

FEEDS and FEEDING NOTES.

Contributed by

The Division of Animal Industry

LAND VALUES, LABOUR COSTS AND BUTTER-FAT PRODUCTION.

IN an article in the *Tasmanian Journal of Agriculture* (November, 1945), Mr. J. T. Armstrong, Chief Dairy Officer of the Tasmanian Department of Agriculture, has presented some striking figures on the relationship of land costs, labour costs and butter-fat production. The fact that the greater the butter-fat production per head the smaller is the interest charge on the land and for labour on each pound of butter-fat is not new, but the figures presented are a further reminder that their significance has not been realised by many dairymen.

Striking figures taken from the tables are as follows:—

Where the land to run a cow costs £60 (*e.g.*, 2 acres per cow at £30 per acre, or 1 cow per acre at £60 per acre), the interest charge for the capital expenditure on the land on each pound of butter-fat, where average production is 150 lb. per head (approximately the New South Wales State average), is 4.8d. By increasing production to 250 lb. per head, this charge on each pound of butter-fat is reduced to approximately 2.9d.—approximately a 40 per cent. reduction or an increase in profit of 1.9d. per lb.

Similarly, the charge for labour on each pound of butter-fat for one man working at award rates and caring for thirty cows is, with an average production of 150 lb., 13.3d. By increasing the average production to 250 lb., labour charge on each pound of butter fat is reduced to 8d.—a 40 per cent. decrease in labour charges and an increase in profit of 5.3d. per lb. of butter fat.

The conclusion by Mr. Armstrong that "many dairymen are either not receiving a fair rate of interest on the capital invested in land and improvements, or are not making award rates for their labour if they are caring for the herd themselves; and that if they are paying for labour in the dairy, some other phase of their farming activity must be paying a proportion of this labour cost" cannot be argued against when the figures presented are examined. These figures were drawn up for Tasmania, but they apply just as well to this State.

Only realisation by dairymen of the inefficiency of low average production in their herds, and a determined attempt to apply the principles of sound feeding, breeding, culling and disease control to raise the average production of their herds, will place the dairying industry on a sound footing.

Stock Inspectors, District Veterinary Officers, Dairy Instructors and Agricultural Instructors are available to dairy farmers for advice on these matters.

Weevilly Wheat Apparently Not Detrimental to Poultry.

IMPORTATION of weevilly wheat from other States for stock feeding purposes raised doubts in some minds as to the possibility of such wheat affecting the health of poultry.

The Australian Wheat Board donated to the Department a supply of wheat heavily infested with weevil, and this was used for feeding to laying and growing stock. One hundred laying hens were fed for approximately two months on a mash-grain ration, the grain being weevilly, without any apparent ill-effects, egg production and health being normal.

Also 50 chickens were taken from 6 to 11 weeks of age on an all-mash ration containing 62.5 per cent. of wheatmeal gristed from the weevilly wheat, and the growth rates and health of these chickens were normal.

These limited experiments indicate that there is little likelihood of weevilly wheat causing any detrimental results when fed even as a very high proportion of the total feed.

THE NUTRITIONAL REQUIREMENTS OF POULTRY.

Practical Application of Results of Research.

(*Continued from Vol.* 56, *page* 566.)

G. L. McCLYMONT, B.V.Sc., Veterinary Officer.

The Possible Importance of Vitamin E.

By working with synthetic diets, vitamin E can be shown to be essential for hatchability and health of chickens. Fortunately, many common poultry feeds such as cereal grains, bran and green feed contain considerable amounts of this vitamin, and deficiency in practical rations would appear to be most unlikely. Experiments in which practical rations have been supplemented with vitamin E-rich feeds, such as wheat germ, have failed to produce evidence that the vitamin E supplement was of any value.

However, there is evidence that vitamin E deficiency may be responsible for some losses in chickens. The vitamin is susceptible to destruction when the grains in which it is contained are crushed and left to stand for some considerable time, or when an excess amount of cod liver oil or other fish liver oils is mixed with the feed.

When the vitamin E is destroyed under these circumstances, chickens between the ages of 2-7 weeks may develop a condition known as Crazy Chick Disease of Nutritional Encephalomalacia. There is incoordination, and convulsive movements such as contraction of the head, somersaults and tremors. It usually occurs suddenly. Losses may vary from an insignificant proportion up to 40 per cent.

Diseases with which it is likely to be confused are rickets, curled toe paralysis caused by riboflavin deficiency, which has previously been discussed, and avian encephalomyelitis, an infectious disease caused by a virus and producing similar symptoms. A feature with outbreaks of the disease (which has not yet been definitely diagnosed here, but quite likely has occurred), is that it is usually completely controlled by changing the feed—that is, if a new batch of freshly-crushed feed is used or the amount of fish liver oil is reduced.

There is no indication that vitamin E is of any particular importance as regards fertility of male birds. Only after a considerable period on special vitamin E-deficient rations has it been possible to affect the fertility of even a small proportion of birds. Vitamin E is involved with vitamin A requirements, inadequate vitamin E increasing the requirements for vitamin A, but research on these aspects has not progressed sufficiently to enable practical application of the results.

Summary.

1.—Vitamin E appears to be of no importance under practical conditions for breeding males, egg production, or hatchability.

2.—Deficiencies caused by using mixed feeds which have been stored for some considerable time or feeding excess fish liver oils may cause mortalities in young chickens.

3.—Prevention and treatment is based on feeding reasonably freshly-crushed feed to chickens and avoiding excess fish liver oils.

(*Continued on page* 50.)

CLARE MITCHELL,
Dip. Home Ec.,
Fruit Preserving Instructor

THIS YEAR'S SPECIAL PROBLEMS.

Bottling Fruit Without Sugar.

THE farmer's wife and the housewife are faced with special problems this year in their efforts to preserve fruit. One of these is that sugar is scarce, and there is a tendency to think that because of this scarcity much of the fruit will have to be wasted. This is not the case. Sugar is not essential to the preservation of fruit for bottling—water will serve the purpose quite well. The fruit will, of course, be unsweetened, but where a large quantity of sugar may not be available at any one time, a few tablespoons can be spared at almost any time.

So bottle the fruit in water, and when each bottle is opened for use, pour off the liquid into a saucepan, add 1 to 2 tablespoons of sugar (or more, to suit the taste), and bring it to the boil. Pour this boiling syrup over the fruit and allow to cool. In this way the fruit will absorb the sweetness.

For jam making, bottle the fruit as pulp, and when a quantity of sugar becomes available at a later date, turn out the fruit and use it to make jam.

To Make Pulp.—Select clean, ripe fruit and wash it well. Cut the fruit up roughly and cook it in its own juice, or with very little water, until quite tender and well cooked.

Heat the bottles in the boiling water bath, and pour the boiling pulp into the hot bottles and seal immediately.

The pulp would probably keep without processing but to ensure success, lower the bottles of hot pulp into the boiling water bath. The bottles should be completely covered with water to a depth of 1 to 2 inches. Leave the bottles of pulp in the boiling water for 5 to 10 minutes. Lift out and cool out of a draught, and store in a cool, dark place.

Lye or Caustic Peeling.

Many people are afraid to use caustic soda to peel peaches, as they are not sure of its effects. They also think the soda can be tasted in the finished product, but this is not the case. The process is a remarkably simple one to carry out, and is free from any danger if normal precautions are used.

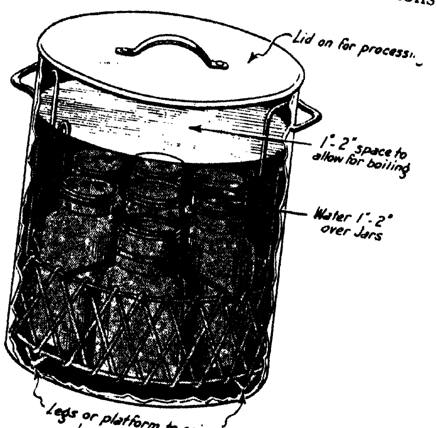


Diagram showing the Jars in the Boiling Water Bath.

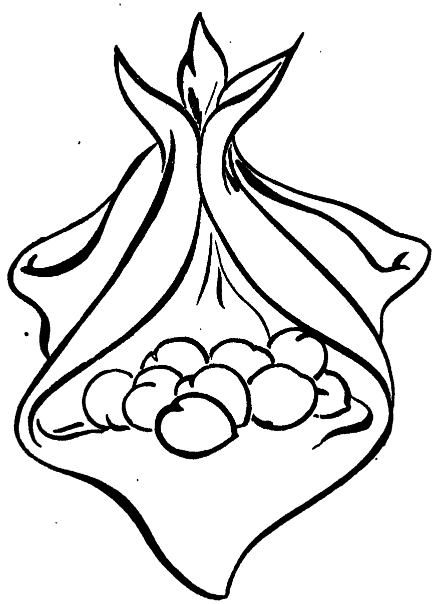


Diagram showing Method of Wrapping Cheesecloth around Fruit for Dipping.

The strength of the lye used is one good tablespoon of caustic to 1 quart of cold water.* This should be heated to boiling point in an enamel or tinned container. Do not use aluminium.

If the peaches are to be halved, this should be done before pealing, as they are too slippery to handle afterwards.

When the lye is boiling, place one piece of fruit into the solution with a wooden spoon and slowly count 25 to 30 (25 to 30 seconds). Lift the piece out and drop into cold water. If the skin washes off easily and the flesh is not darkened, the time required to remove the skin is known and more can be added next time.

If the skin is not removed, longer immersion is required, or if the flesh is darkened, a shorter period would suffice.

Having decided the length of time required, place the fruit in a wire basket or, in a piece of cheesecloth which can be held by the four corners. Lower this into the lye for the required time and then drop the fruit into cold water. Running water is best, but if this it not available, lift the fruit out of the first cold water and dip into

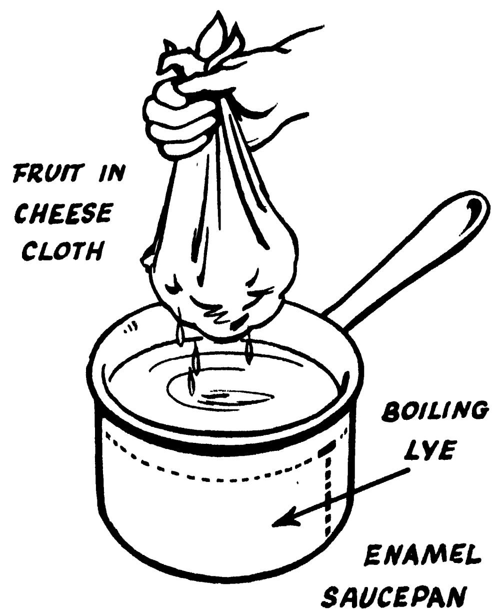


Diagram showing Method of Dipping Fruit in Lye.

a second, before handling the fruit. In this way no injury can be done to the hands.

The fruit should then be trimmed if necessary and washed well to remove lye.

* Lye solution will bubble and froth over if caustic is added to hot water, so add the caustic to cold water then heat it.
Vinegar is the antidote to caustic burns, so if the operator receives a splash, vinegar should be applied to the part.

The Nutritional Requirements of Poultry—*continued from page* 48.

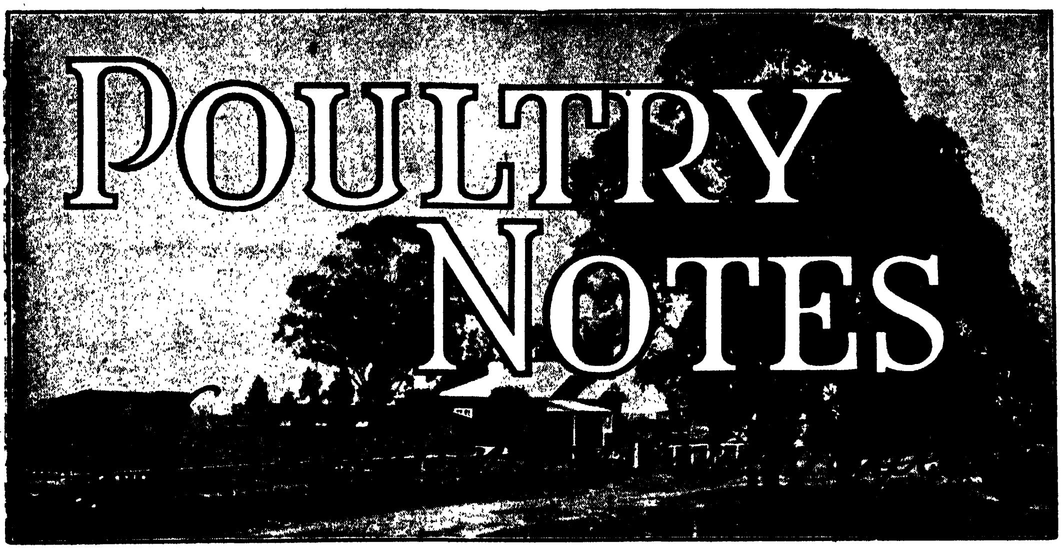
—continued from page 48.

Other Vitamins.

The vitamins so far discussed are far from being all that are required by poultry. Others necessary in the diet are Thiamine, Pantothenic Acid, Pyridoxin, Biotin, Niacin, Vitamin K, Pyracin and other factors which have been less well defined. It has not yet been shown that any of these vitamins are of great practical importance, but it is quite possible that future research will indicate that unthriftiness and mortalities at present obscure might be due to deficiencies of one or more of these vitamins.

In particular, Pantothenic Acid may yet be found to be of some importance as regards hatchability on certain types of rations.

(*To be continued.*)



"AUTUMN" HATCHING

Undesirable, except in Special Circumstances, this Season.

"AUTUMN" or late-summer hatching is mainly carried out with a view to rearing birds for market or to augment the laying flock, but this year owing to the restricted amount of wheat available to poultry farmers, it is undesirable, except in special cases to attempt hatching at this time of the year.

As far as the raising of cockerels is concerned it is probable that some restriction on the supply of wheat will be imposed on those who engage in rearing them, as was done during the past season, and while mill offals will be more plentiful, it is doubtful if supplies will be sufficient to provide for raising cockerels.

In regard to the rearing of pullets the position is that the only circumstances which might justify putting through small numbers, are where the building of a farm was delayed too late for commencing last spring, and where an unstocked farm has been purchased and it is desired to gain some experience before starting the main season.

There are, however, a few drawbacks to autumn rearing which should be taken into consideration by anyone contemplating these operations—even in normal times.

In the first place there is a risk of the chickens contracting chicken pox while they are still young, and thus causing losses, as this is the time of the year that chicken pox is prevalent.

The pullets come into production about July or August, according to the breed and the month in which they were hatched, and they lay small eggs during the flush season when prices are low. They will then go through a full moult in the autumn the same as hens, which means that they will be out of production for several months.

Another even more serious objection is that in most cases the chickens will be reared on the same ground as used for the spring chickens without it having been spelled long enough to ensure that there is no disease infection. Thus there is always a danger of an outbreak of disease, either among the autumn chickens or those raised in the main season. Therefore the only conditions under which "autumn" hatching might be carried out in normal seasons with any degree of safety are where separate rearing equipment is available, or perhaps where only one batch of chickens is raised during both autumn and spring, and the ground can be spelled for four to five months between the seasons.

Care of the Layers.

One of the main objectives on a poultry farm is to maintain egg production at the highest possible level when prices are high, and there are a few important factors in the management and housing of pullets and hens which have a definite bearing upon results from now onwards. It cannot be expected, of course, that a gradual decline in production from the hens can be avoided, but if they are not managed properly an early moult might occur which will result in a loss of production, in most cases, for at least several months. Similarly, any mishandling of pullets will often cause a moult, with consequent loss of eggs, although the moulting period may not be as long as in the case of hens.

Housing Conditions.

Apart from correct feeding, which has a very important bearing upon production, but under present conditions may be difficult to ensure, the next most important item in the care of layers is the housing.

One of the first considerations is adequate ventilation, which can be provided by allowing an aperture of about 6 inches along the back of the house just under the roof. This, of course, applies to open fronted houses which are mainly used for layers.

Next in importance is the arrangement of the perches. These should be not less than 20 inches apart and about the same distance from the floor, the back perch being 15 inches from the wall. If the perches are closer together it does not allow of free circulation of air between the rows of birds, without which the birds become overheated on hot nights, and this is a common cause of an early moult.

The space allowed per bird on the perches is important; at least 30 feet of perch should be provided for each fifty birds, or an average of 7 inches per bird.

On no account should birds be overcrowded in the houses during the summer, as this will lead to an early moult. It is preferable to cull out a larger number of hens, rather than to overcrowd the pens in an endeavour to make room for the pullets.

Do Not House Pullets in Large Numbers.

One of the common mistakes made by even experienced poultry farmers is the running of too many pullets together; this causes many troubles. Frequently flocks of 150 pullets and more are placed in large sheds when about three months of age, and even though they do not occupy all the perches in the shed, they suffer through their habit of packing together at night. For this reason there is always a risk of running young birds in numbers exceeding 100 until the cooler weather of the autumn commences, but it is more satisfactory to keep them in lots of fifty to seventy-five until they are fully grown.

Even pullets which are just coming on to lay should not be housed in large numbers

Suitable Conditions for Young Stock.

until the hot weather of the summer has passed. The best course is to fill the laying houses only to about two-thirds of their adult capacity, and then, when the cooler weather of the autumn commences, the balance of the birds can be transferred; the later birds will thrive much better if kept under the colony system until after the end of the summer.

Look Over the Pullets.

During January is a good time to sum up the young stock to ascertain whether satisfactory development has been obtained. If the hatching season finished at the end of September, by which date operations should cease on commercial poultry farms, the youngest pullets will now be about three months of age, and if they have been overcrowded or run on stale ground, they may be backward and unthrifty in appearance. Such birds, unless given good range from now onwards, are not likely to be worth keeping, as they will make no further development until the cooler weather commences. Where the birds have had a severe setback and are pale and thin, they are scarcely likely to pay to keep, as they are unlikely to commence production before they are eight to nine months old. Thus the best course is to cull heavily rather than waste feed until they come into production.

Clean Up the Chicken Pens.

By this time of the year, the brooders and weaning pens should be empty and the work of thoroughly cleaning and disinfecting should be carried out without delay, so as to leave them in a proper sanitary condition to spell for the next season. If this work is delayed unduly, the outside runs become overgrown with grass or weeds, which renders the cleaning of the surface difficult, and any accumulation of manure will remain in the runs.

The correct procedure to follow is to scrub thoroughly and wash down the indoor woodwork and floors, also scrape the surface of the outside runs to remove all manure. After scrubbing the indoor portions, a strong disinfectant solution should be sprayed all over the pen, and if any disease was experienced amongst the chickens in the pen, the outside runs could be treated by saturating the surface with a solution of caustic soda used at the rate of 1 lb. to 5 gallons of water. After treatment, the runs should be left open to the weather until the next season.

Care is necessary in handling this solution to avoid it splashing the eyes or coming into contact with tender skin.

Where chickens have been run over the same ground in small pens for a number of years it is a good practice to remove 3 inches to 4 inches of surface soil, and after leaving the ground exposed to the weather for a month or so, fill up again with clean soil which should be allowed to settle down solidly before the pens are again used for chickens.

Green Feed Crops.

GREEN feed is a most important item in the diet of poultry and no efforts should be spared to provide a continuous supply throughout the year. Apart from its value in maintaining the health of the birds, an adequate supply assists in improving the yolk colour and adds variety to the diet.

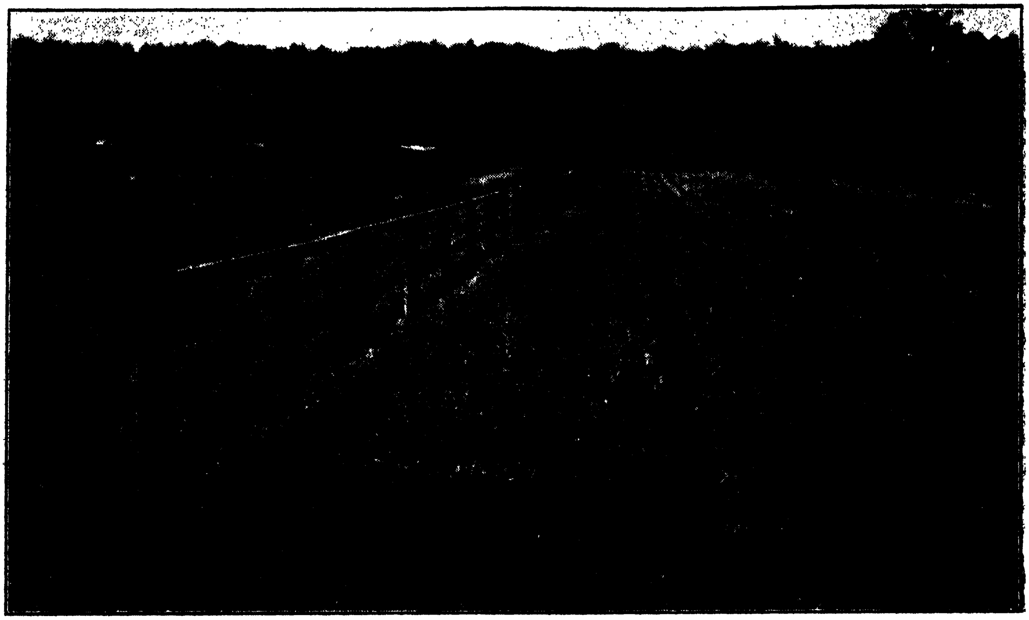
Lucerne is, of course, the most satisfactory crop not only from the point of view of food value, but also to maintain a permanent supply. A "stand" of lucerne grown in drills and watered by an overhead spray will, with reasonable attention, last for five to seven years. Thus, this crop should receive first preference, but as it does not grow profusely in the winter months, it is advisable to grow other crops to keep up the supply during the winter. For this purpose, one of the best crops is Berseem clover, which will grow readily in the cold weather and provide several cuts up to the end of October. The best month for sowing this crop is February, and it can be sown either broadcast or in drills.

Other suitable crops which may be sown in February are barley, rape, and silver beet, and in March barley, oats, wheat, rape, silver beet and wong bok.

April is the best month for sowing lucerne, but when the weather is favourable and the ground is thoroughly prepared, it can also be sown in March. Other suitable crops for planting in April are oats, barley, silver beet, wong bok and red clover.

Any of the crops, such as Berseem clover, barley, rape, silver beet, oats, wheat and wong bok will provide a fairly good supply during the winter, but Berseem clover can be cut more frequently and will last longer than most of the others.

Those wishing to sow crops during February should concentrate on preparing the soil in order to have it free of weeds before sowing the seed. If the ground is not thoroughly clean, the weeds and grass come up with the crop and choke it before it is properly established.



A Green Feed Plot.

Oats and Barley for Poultry.

AS substantial supplies of oats and a lesser quantity of barley are available this season, and the quantity of wheat for stock feeding will be restricted, it becomes necessary for poultry farmers as well as other stock feeders to incorporate a proportion of these additional cereals in the rations.

Oats are obtainable in truck lots at a price comparable with wheat, and barley at a little higher rate on an equal weight basis.

Where possible the birds should be gradually accustomed to the change by starting with about 10 per cent. of either oats or barley or a combination of both, working up to a maximum of, say, 33 per cent., in the afternoon feed, but if oats of good plump quality or good types of barley are available, the quantity could be increased to somewhat over this amount. In addition there would be no objection to including 20 to 30 per cent. of finely ground oats or barley to the morning mash.

If only thin oats are available, it would be preferable, when feeding them as grain, to soak them in the same way as soaked wheat, for 24 to 36 hours.

List of Chick Sexers.

IN the list of qualified chick sexers published in last month's Notes the name of Mrs. H. M. Leach was inadvertently omitted. Mrs. Leach qualified for a First-class Certificate in 1943.

In some cases, owing to the shortage of wheat it may be necessary to use a greater proportion of oats or barley than indicated, but this will not cause any trouble if only fed over short periods, provided the birds will eat the grain readily, and that a sudden change is not made from wheat to oats or barley.

Tubercle-free Herds.

THE following herds have been declared free of tuberculosis in accordance with the requirements of the scheme of certifying herds tubercle-free, and, unless otherwise declared, this certification remains in force until the date shown in respect of each herd :—

Owner and Address.	Number Tested.	Expiry Date.
Registered Stud Herds.		
Bathurst Experiment Farm (Guernseys) ...	28	12/10/46.
Berry Training Farm, Berry (A.I.S.)... ...	120	25/11/45.
H. F. Bradley, "Nardoo," Ashford Road, Inverell (Jerseys)	40	13/4/47.
L. W. Campbell, "Dunmallard," Fern Hill Road, Inverell (Jerseys)	39	21/7/47.
E. J. Cattell, "Kapunda," Rob Roy, Inverell (Jerseys)	121	30/6/47.
Christian Bros., Novitiate, Mt. St. Joseph, Minto	25	11/9/46.
B. N. Coote, Auburn Vale Road, Inverell (Jerseys)	85	23/7/47.
Cowra Experiment Farm (Ayrshires)... ...	53	9/7/46.
Department of Education, Yanco Agricultural High School (Jerseys)	66	15/2/46.
R. C. Dixon, Elwatan, Castle Hill (Jerseys)	29	5/3/47.
Farm Home for Boys, Mittagong (A.I.S.) ...	31	24/7/46.
Farrer Memorial Agricultural High School, Nemingah (A.I.S.)	44	28/8/47.
N. L. Forster, Abington, Armidale (Aberdeen-Angus)	164	19/5/46.
Forster and Sons, Abington, Armidale (Jerseys)	86	19/5/46.
A. D. Frater, King's Plain Road, Inverell (Guernseys)	107	11/4/47.
Grafton Experiment Farm (Guernseys) ...	249	30/7/46.
Hawkesbury Agricultural College, Richmond (Jerseys)	82	19/3/46.
Hurlstone Agricultural High School, Glenfield (Ayrshires)	52	21/7/46.
Kahlua Pastoral Co., "Kahlua," Coolac (Aberdeen-Angus)	257	30/11/47.
E. L. Killen, "Pine Park," Mumbil (Beef Shorthorns)	261	25/9/46.
G. Knight, Tannabah, Coonabarrabran ...	60	30/11/46.
Lidcombe State Hospital and Home (Friesian)	111	3/10/46.
Limond Bros., Morisset (Ayrshires)	62	28/1/46.
McGarvie Smith Animal Husbandry Farm, Liverpool (Jerseys)	68	22/2/47.
W. W. Martin, "Narooma," Urana Road, Wagga (Jerseys)	160	11/7/46.
Navua Stud Farm, Grose Wold, via Richmond (Jerseys)	120	8/10/47.
New England Experiment Farm, Glen Innes (Jerseys)	32	6/3/46.
Peel River Land and Mineral Co., Tamworth (Poll Shorthorns)	110	16/10/46.
C. A. Penney, "Bringa," Dapto (Guernsey and A.I.S.)	97	8/3/46.
W. R. Raper, Calool, Culcairn (Beef Shorthorns)	66	7/3/46.
D. B. Reid, "Evandale," Sutton Forest (Aberdeen-Angus)	61	23/11/47.
Riverina Welfare Farm, Yanco (Jerseys) ...	130	26/6/46.
F. S. Simpson "Gunnawarra," Gulargambone (Beef Shorthorns)	167	19/11/47.
Trangie Experiment Farm, Trangie (Aberdeen-Angus)	148	15/3/46.
Wagga Experiment Farm (Jerseys)	61	10/2/46.
H. F. White, Bald Blair, Guyra (Aberdeen-Angus)	300	20/4/47.
Wollongbar Experiment Farm (Jerseys) ...	97	1/3/46.
Woomargama Estate, Hume (Beef Shorthorns)	206	7/3/46.
A. Young, "Daylesford," Cudal (Beef Shorthorns)	27	3/1/46.
Herds Other than Registered Stud Herds.		
114 A.G.H., Kenmore...	70	6/6/46.
Aboriginal Station, Brewarrina	14	20/5/46.
Aboriginal Station, Wallaga Lake	19	29/2/46.
Australian Missionary College, Cooranbong...	100	30/8/47.
Barnardo Farm School, Mowbray Park ...	45	25/5/46.
Brookfield Afforestation Camp, Mannus ...	203	3/5/46
N. Cameron, Montrose, Armidale (Late New England Girls School)	33	20/2/47.
Department of Education, Gosford Farm Home	37	26/2/47.
A. N. De Fraine, Reservoir Hill, Inverell ...	21	8/6/47.
Ehsman Bros., Inverell	31	22/8/46.
Emu Plains Prison Farm	108	7/11/45.
Fairbridge Farm School, Molong	25	15/4/46.
F. J. Foy, The Valley Farm, Megalong Valley	24	14/12/45.
W. J. Frizelle, Rosenstein Dairy, Inverell ...	134	16/8/47.
Goulburn District Hospital	5	6/11/45.
W. S. Grant, Braidwood	23	6/2/46.
A. Hannaford, Braidwood	10	7/2/46.
F. C. Harcombe, Hillcrest Farm, Warialda Road, Inverell	53	10/4/47.
F. W. Hunt, Spencers Gully...	27	16/2/47.
Koyong School, Moss Vale	2	5/3/46.
J. H. Lott, "Bellevue," Rob Roy, Inverell...	41	26/6/47.
Lunacy Department, Callan Park Mental Hospital	34	21/4/46.
Lunacy Department, Gladesville Mental Hospital	20	15/4/46.
Lunacy Department, Morisset Mental Hospital	79	8/3/47.
Lunacy Department, Parramatta Mental Hospital	62	26/7/47.
Lunacy Department, Rydalmere Mental Hospital	57	30/10/46.
J. O. McGufficke, "Lovely Bank," Rob Roy, Inverell	33	25/6/47.
R. G. P. McLane, Ibis Valley, Swanbrook	36	29/5/46
S. W. Morris, "Dunreath," Swanbrook Rd., Inverell	43	8/6/46.
J. A. Murray, "The Willows," Keiraville...	21	8/8/46.
New England University College, Armidale...	19	1/5/47.
Orange Mental Hospital	61	21/2 46.
Parker Bros., Hampton Court Dairy, Inverell	125	25/8/4[illegible].
Peat and Milson Islands Mental Hospital ...	25	6/9/46.
G. T. Reid, "Narrengullen" Yass	167	14/7/46.
C. E. D. Richardson, Kayuga Road, Muswellbrook	101	3/7/45.
V. J. Rolfe, "Mount View," Inverell ...	17	12/2/4[illegible].
Royal Prince Alfred Hospital, Camperdown; "Yaralla" Herd	94	27/11/4[illegible].
State Penitentiary, Long Bay	13	30/11/47.
W. J. Stephenson. "Hill View," Fig Tree ...	53	4/2/46.
St. Ignatius College, Riverview	23	7/2/46.
St. John's College, Armidale	13	12/11/45.
St. Michael's Orphanage, Baulkham Hills ...	26	1/6/46.
St. Patrick's Orphanage, Armidale... ...	10	15/11/46.
St. Vincent's Boys' Home, Westmead ...	37	3/7/46.
The Sydney Church of England Grammar School, Moss Vale	47	11/12/45.
J. M. Turnbull, "Pastime," Kayuga Road, Muswellbrook	86	20/3/47.
A. B. Weidman, No. 2 Dairy, Aberdeen Road, Muswellbrook	68	3/9/46.
A. B. Weidman, No. 3 Dairy, Kayuga Rd., Muswellbrook	38	6/9/46.
A. B. Weidman, No. 4 Dairy, Kayuga Rd., Muswellbrook	57	2/11/46.
T. J. Wilks, "Oaks Farm," Muswellbrook ...	27	27/6/46.
A. G. Wilson, "Blytheswood," Exeter ...	57	6/6/46.
C. Wilton, Bligh Street, Muswellbrook ...	54	12/5/46.
Youth Welfare Association of Australia ...	142	19/3/46.

Tubercle-free Areas.

The following Areas have been declared tubercle-free and no cattle are allowed to be kept therein unless subjected to the tuberculin test and found free from tuberculosis :—

Bombala Area.
Inverell Area.
Braidwood Area.
Municipality of Muswellbrook.
Municipality of Queanbeyan.

MAX HENRY, Chief of Division of Animal Industry.

Brucellosis-free Herd Scheme (Swine).

THE following is a list of the names and addresses of owners of herds which have been declared brucellosis-free in accordance with the requirements of the Brucellosis-free Herd Scheme (Swine). The work in connection with this scheme has been undertaken as part of the general campaign against this disease and should perform a valuable service to the industry generally. Owing to the limitations of staff it will not be possible for the Department to undertake the testing of herds in general for this purpose, and in future only herds belonging to Government institutions, registered stud herds, or those containing a preponderance of registered stud animals, will be accepted for inclusion in the list. A charge will be made for the work, since the inclusion of a herd in this list should be of benefit to the owner. After a herd has been accredited, two semi-annual tests will be required, and thereafter annual tests, provided that the conditions outlined in the agreement form are strictly adhered to and that negative results are obtained at each test. So far as the elimination of the disease is concerned, apart from placing the herd on the accredited list, this work will continue as at present.

Registered Stud Herds.

Bathurst Experiment Farm, Bathurst.
Boardman, C., Camden.
Campbell, D., "Hillangrove," Wamberal, via Gosford.
Cowra Experiment Farm, Cowra.
Croft, F., Lugwardine, Kentucky.
Draper, R. E., "Glengar," Capertee.
Farrer Memorial Agricultural High School, Nemingha.
Foley, J. B., Gundurimba Road., Loftville, via Lismore.
Garrison Battalion (2nd), Manly.
Gladesville Mental Hospital.
Government Agricultural Training Farm, Scheyville.
Grafton Experiment Farm, Grafton.
Harris, K. H., Pennant Stud Piggery, Purchase Road, West Pennant Hills.
Hawkesbury Agricultural College, Richmond.
Holland, A. L., Argonne, Tubbul.
Hurlstone Agricultural High School, Glenfield.
Maybin, N. C., Towac, Orange.
New England Experiment Farm, Glen Innes.
Newington State Hospital and Home, Newington.
Ricketts, C. C., "Mangus," Young.
Riverina Welfare Farm, Yanco.
Rydalmere Mental Hospital.
Shirley, G. F., "Camelot," Penrith.
Upston, H. E., Wattle Tree Road. Holgate, via Gosford.
Wagga Experiment Farm, Wagga.
White, A. N., Blakeney Stud, Orange.
Williams, G. R. B., "Gwandalan," Grenfell.
Wollongbar Experiment Farm, Wollongbar.
Yanco Agricultural High School.

Herds Other than Registered Stud Herds.

A.G.H. (114 Australia).
Bathurst Gaol, Bathurst.
Brookfield Afforestation Camp, Mannus.
Callan Park Mental Hospital, Callan Park, Rozelle.
Emu Plains Prison Farm.
Glen Innes Prison Camp, Glen Innes.
Gosford Farm Home for Boys, Gosford.
Goulburn Reformatory, Goulburn.
Higgins, J. P., "Koranga," Camden.
Lidcombe State Hospital.
Morisset Mental Hospital, Morisset.
Parramatta Gaol, Parramatta.
Parramatta Mental Hospital.
Peat and Milson Islands Mental Hospital, Hawkesbury River

Abortion-free Herds.

THE following herds have been declared free of contagious abortion (Bang's disease) in accordance with the requirements of the scheme of certifying herds abortion-free:—

Owner and Address.	Number in herd.
Registered Stud Herds.	
Bathurst Experiment Farm (Guernseys)	28
Cowra Experiment Farm (Ayrshires)	71
Department of Education—Farm Home for Boys, Mittagong (A.I.S.)	52
Dixon, R. C., "Elwatan," Castle Hill (Jerseys)	29
Fairbairn & Co., C. P., Woomargama (Beef Shorthorns)	98
Farrer Memorial Agricultural High School, Nemingha (A.I.S.)	44
Forster and Sons, Abington, Armidale (Jerseys)	59
Forster, N. L., Abington, Armidale (Aberdeen-Angus)	179
Hann, O., Chatsworth Road, St. Marys (Jerseys)	14
Hann, O., "Bomerah," Barrington (Jerseys)	42
Hawkesbury Agricultural College, Richmond (Jerseys)	96
Hill, E. Pritchard, Bowling Alley Pt. (Jerseys)	96
Hordern, E. D., Cabramatta (A.I.S.)	95
Hurlstone Agricultural High School, Glenfield (Ayrshire)	53
McEachern, H., Tarcutta (Red Poll)	61
McSweeney, W. J., "The Rivers," Canowindra (Beef Shorthorns)	76
Martin Bros. "Narooma," Urana-road, Wagga (Jerseys)	160
Navua Stud Farm Grose Wold, via Richmond (Jerseys)	120
New England Experiment Farm, Glen Innes (Jerseys)	32
Peel River Land & Mineral Co., Tamworth (Poll Shorthorns)	86
Simpson, F. S., "Gunnawarra," Gulargambone (Beef Shorthorns)	150
Training Farm, Berry	118
Trangie Experiment Farm, Trangie (Aberdeen-Angus)	148
Wagga Experiment Farm, Wagga (Jerseys)	25
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MAX HENRY, Chief of Division of Animal Industry.

Editorial—

The Food and Agriculture Organisation (F.A.O.)

FOOD is one of the basic human requirements. It is estimated, however, that of the 2,000 odd million people comprising the sixty separate nations of the world, approximately two-thirds suffer because their food supplies are insufficient or are deficient in nutritive values. For this, poverty and ignorance are largely to blame.

The Under Secretary and Director of the New South Wales Department of Agriculture (Dr. R. J Noble) recently returned from the City of Quebec in Canada, having fulfilled the role of Leader of the Australian Delegation to the first conference of the Food and Agriculture Organisation—the first permanent instrument actually created by the United Nations—designed to promote better levels of nutrition among the peoples of the world and to promote international co-operation in food production, distribution and utilisation.

At this first F.A.O. Conference, a policy was outlined and suggestions were made for definite programmes by committees which dealt with Nutrition and Food Management, Agriculture, Forestry and Forest Products, Fisheries, Marketing and Statistics. The suggestions of the committees are to be implemented by a Director-General.

The outstanding fact of the committee reports is that the peoples of the world can now, if they wish, take great steps forward along the road towards freedom from want by the energetic application of existing knowledge, working together through F.A.O., without waiting for the results of the surveys and researches recommended by the committees. The existence of F.A.O. means that problems of production and consumption which have previously been considered in isolation can now be brought together, and practical solutions have become possible. In the words of the Chairman of the Policy and Programme Commission of F.A.O., "The United Nations have found a platform on which they can work together toward an economy of abundance."

The Food and Agriculture Organisation is a development from the May, 1943, conference of delegates of all the United Nations held at Hot Springs, Virginia, to devise means of implementing the Atlantic Charter pledges of—

> "Securing for all, improved labour standards, economic adjustment and social security," and
>
> "Assurance that all men in all lands may live out their lives in freedom from fear and want."

At the Hot Springs Conference an Interim Commission was formed to draw up a constitution for a permanent organisation and subsequently it drafted the following Declaration which was signed by all member Governments at the Quebec F.A.O. Conference.

"The said Governments and authorities solemnly pledge to their own peoples and to one another, that they will work separately and together to the end that want and the fear of want shall be progressively abolished, and for this purpose will take all measures within their power:

"To raise the level of nutrition and the standard of living of the peoples under their jurisdiction;

"To improve the efficiency of agricultural production and distribution."

And they resolved:

"To co-operate for the achievement of these ends and for this purpose to establish a permanent organisation for food and agriculture;

"To report to one another through this organisation on the measures taken and the progress achieved."

The F.A.O. is especially concerned with the welfare of primary producers, for unless farming is profitable to farmers themselves, the food itself cannot be produced. It also has a special significance to Australia, for the correlation of agricultural production with an improved level of nutrition for the peoples of the world was most vigorously advanced by Australian representatives in the Council of the League of Nations ten years ago. The Commonwealth Government of Australia was the first to ratify its adherence to the constitution of the F.A.O.

Agricultural Training of Ex-Servicemen.

School for Instructors.

A SCHOOL for Agricultural Officers whose job it will be to organise courses of instruction for ex-servicemen who select a land career was held at Hawkesbury Agricultural College, Richmond, from 14-25th January. Between thirty and forty officers from New South Wales and other States were in residence at the College for the ten days.

"It was a very fine thing that Agricultural Officers from the various States should be brought together with a view to developing an Australia-wide, uniform, and efficient type of ex-servicemen's agricultural training course," commented the New South Wales Minister for Agriculture (Hon. E. H. Graham, M.L.A.)

"I was pleased to be able to make available accommodation at Hawkesbury Agricultural College for this School," he said "and feel confident that the Officers who have attended will be better equipped for carrying through the exacting responsibility of ensuring that the schools which they subsequently organise for ex-servicemen are sound and practical. It is incumbent upon us, I feel, to ensure the success of all ex-servicemen who settle on the land."

"The value of the courses of instruction for ex-servicemen will depend largely on the teaching methods employed by the Instructors, and the aim of the Hawkesbury College School has been to perfect Officers in those methods."

The School was organised by Mr. C. C. Crane, Chief Division of Information and Extension Services of the New South Wales Department of Agriculture.

Opening Up the Grass Silage Stack.

As the best quality silage is produced in the heart of the stack, care must be exercised to expose as small an area as possible to the air, because moulds form rapidly and the silage deteriorates in consequence. Remove the boards or bags and the soil from one portion of the stack, taking care to see that the remaining protective covering is not unduly disturbed, and cut the silage out in a face right down to the ground level before commencing on another section of the stack. The area worked on will depend on the size of the herd to be fed, but only enough should be cut out each day to supply the animals with sufficient feed for that period. A squaring axe is one of the handiest implements for this purpose, or a special silage knife may be used.

A cubic foot of well-cured, good quality grass silage will weigh approximately 45 lb.

Grass silage can be used in from eight to ten weeks from the time of stacking, although if left for a longer period a more matured product of better quality will be obtained.

A Co-operative Effort in—

MAKING SILAGE ON THE UPPER HUNTER.

Waste Converted to Stored Fodder.

J. W. G. SMITH, H.D.D., Senior Dairy Instructor.

HOW often does one hear a dairy farmer say, "If it rains all will be well, and if it does not, then we will have to make the best of it"—or words to that effect. This appears to be the attitude adopted by far too many farmers towards the provision of feed for their livestock—particularly when it is a fact that every stockraising district in this State experiences at one time or another, periods when crops and pastures fail to provide sufficient feed.

Conservation of fodder in any form is still regarded as a doubtful proposition by some primary producers. It means work, and as it must be done in times of plenty, it appears to some farmers to be a waste of energy.

These and other farmers will be interested in the experience of the farmers of the Upper Hunter Valley who, in co-operation with the Hunter Valley Co-operative Dairy Co. Ltd., conserved a lush growth of herbage and grass in pit silos this season, at a cost which will be appreciated when a dry period occurs again and feed is scarce and dear.

With a good early spring, following good winter rains, the Upper Hunter Valley, after years of drought, blossomed this season into a real "paradise." The growth of herbage and grass was excellent. The farmers were advised to conserve as much as possible of this wonderful growth, but many already had enough fodder crops for their conservation requirements, and no labour could be found to do this extra work.

A Plan Formulated.

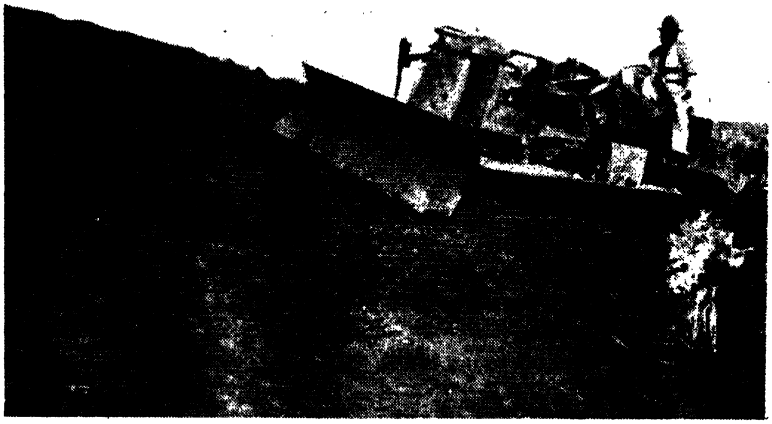
The far seeing management of the Hunter Valley Co-operative Dairy Co. Ltd. realised that if something was not done quickly much valuable fodder would be wasted instead of being conserved for use when another drought season occurred.

In co-operation with departmental officers, a scheme was drawn up and a committee

Cutting a Crop of Thistle for Ensilage. Note the height of the growth.

formed to work out ways and means of conserving this vast amount of fodder, which consisted of thistles and herbage, together with self sown crops and grasses.

The pits put down and filled, held approximately 50 tons of silage each, although where the crops of herbage were good some larger pits were made. In total



The Bulldozer used for Pit Sinking.

A Pit Silo Ready for Filling.

The Task Performed.

The Company made its machinery pool available. A bulldozer was hired and the work of sinking pits commenced, even though the labour available was not experienced. The work of cutting and filling these pits was then attempted, again with unexperienced labour, and because machinery suitable for the hauling of heavy greenstuff could not be procured, ordinary hay push sweep rakes were used, although these were too light for the work.

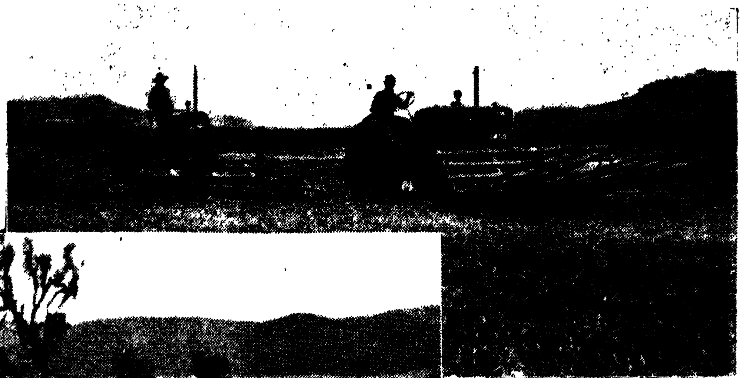
twelve pits were constructed and filled, and it is estimated that 750 tons of silage were made. The demand for the construction and filling of pits could not be met because of the shortage of machinery and labour.

A Good Investment.

The whole cost of the scheme to the farmers concerned amounted to approximately 25s. per ton, and there will be no cost of pit excavation the next time the pits are to

(*Continued on page* 74).

Setting out with Push Sweep Rakes to pick up a Load of Greenstuff.



The Rake with a Load of Thistles.

Dropping the Load into the Pit.

A Pit Filled and Ready for Covering.

THE FOOD AND AGRICULTURE ORGANISATION

Conference at Quebec.

ITS IMPORTANCE TO AUSTRALIA.

R. J. NOBLE, Ph.D., B.Sc.Agr., Under Secretary and Director, and Leader of the Australian Delegation.

THE Food and Agriculture Organization was constituted at its Conference held in Quebec, in October. It is the first instrument actually created by the United Nations, and is designed to promote international co-operation in food production, distribution and utilization, and thus help in ensuring the continued peace of the world.

It aims at the economic production of a sufficient amount of food, and of the right types of food for the peoples of the world, and it is concerned, especially, with the welfare of primary producers for, unless farming is profitable to farmers themselves, the food itself cannot be produced.

The ideal of freedom from want is a very high one. It involves the solution of many complicated problems. But the Australian Government and those of more than thirty other nations believe that these problems can be solved, and that their solution will result in incomparable benefits to all mankind.

As a result of the conference the peoples of the world now have an opportunity to bring together for solution, problems of nutrition and food supply, which could not be solved in isolation. The conference set up a Director-General to implement the recommendations of the six committees which examined every field of F.A.O. responsibility—which embraces all aspects of the production, distribution and consumption of the products of the farms, forests and fisheries of the world.

IN the ancient, walled, Canadian city of Quebec, world history was made once again in October, 1945. Almost 200 years ago on the Plains of Abraham, the British General Wolfe won the battle which determined the future of the great Dominion of Canada, and much more recently, on two momentous occasions, our wartime leaders met at Quebec and prepared the plans which finally led to victory over our enemies.

On this occasion delegates from the United Nations met for the first conference of the new Food and Agriculture Organisation to formulate plans and proposals which, it is believed, will have a most material effect in ensuring the continued peace of the world.

This is the first of the United Nations permanent organisations. The Governments of more than thirty nations have passed the necessary legislation adhering to the constitution of this new body, and the representatives of the Governments of thirty nations have formally signed the actual document of adherence to the constitution of the organisation.

While it is true that this new world organisation is advisory in character in that it will draft proposals for approval by Governments, its basic aim is to promote better living standards on a world-wide basis by promotion of better levels of nutrition among the peoples of the world. Difficult as it no doubt will be, effort will be made to establish a greater measure of stability of primary producers on an expanding market, which is developed in turn by the action taken by all nations individually and in co-operation with one another to improve nutritional standards of peoples throughout the world.

The Food and Agriculture Organisation will be closely co-ordinated with the work of the World Economic and Social Council. The nature of the task in food and agriculture is sufficiently well defined, however, to justify the belief already expressed by all the signatory Governments, that the Organisation itself will be a very real means of promoting international co-operation in its best and most effective sense.

The Origin of F.A.O.

Briefly the Organisation arises from the conception of "freedom from want." Some two years ago the representatives of forty-four nations were called together by the late President Roosevelt to a world conference at Hot Springs, Virginia, in the United States. This Conference recommended that Governments should formally agree "to collaborate in raising levels of nutrition and standards of living of their peoples and report to one another on the progress achieved."

Arising from this conference the Governments of the United Nations agreed to set up an Interim Commission which prepared its reports for consideration by the Governments participating in this new collaborative venture.

While it was recognised that freedom from want was difficult if not impossible to achieve without concerted action among nations it would be difficult if not impossible also to arrange for such collaboration without the establishment of a world-wide organisation. The Interim Commission suggested the establishment of such a body and with the approval of the signatory Governments the Food and Agriculture Organisation is now in being.

Plenary Session Food and Agricultural Organisation Conference, Quebec, Canada, October, 1945. Held in the Chateau Frontenac Ball Room.
Delegates were seated in alphabetical order of countries. Dr. Noble as leader of the Australian Delegation, sat at the top of the left-hand table.

There is one fundamental principle on which the Food Agriculture Organisation is based, and that is that the welfare of consumers and the welfare of producers are in the final analysis identical. Sometimes it has seemed in the past that they have been in conflict, and the task of the Food and Agriculture Organisation is to devise proposals which effect reconciliation

of differences as they arise, and thus ensure real progress towards freedom from want and a higher living standard for all. The task is no easy one. The economic and profitable production and distribution of foodstuffs is a highly complicated matter, and it is of special significance to great agricultural producing countries such as ours in Australia. The conference is of special significance to Australia also for another reason, for the idea of correlating agricultural production with an improved level of nutrition for peoples throughout the world was also most vigorously advanced by our own Australian representative in the Councils of the League of Nations some ten years ago.

F.A.O. will be concerned, in the first place, with nutritional and food consumption levels throughout the world. There are acute shortages of foodstuffs in the world to-day as a result of the ravages of war, but at the same time war-time experience has added greatly to a knowledge of the means whereby the proper utilisation of foodstuffs may be ensured, thus safeguarding and even enhancing nutritional levels in spite of shortage of supply. This knowledge naturally will be applied in some of the problems which will be before the Organisation.

The provision of foodstuffs for war ravaged countries is the immediate task of the United Relief and Rehabilitation Administration. The task of F.A.O. is to provide the first long-range plans, aiming at an improving living standard throughout the world.

A demand and a continuing demand for foodstuffs is considered likely materially to stabilise agricultural production at higher levels.

A Summary of F.A.O. Functions.

The task of the F.A.O. is clear. Its function is advisory to all the Governments now comprising the Organisation, and its task is to examine means whereby freedom from want may be achieved:

Firstly, by examining levels of nutrition and health among peoples of the nations of the world;

Secondly, to set targets, if one may so call them, for levels of production and then to study means whereby agricultural production can be efficiently, economically and effectively increased to meet the demands which such levels should require if this demand is to be met;

Thirdly, to study means whereby distribution may be improved—a complex matter in itself; and

Finally, to study the international machinery which may be required to facilitate the production and the distribution of an increased volume of agricultural commodities.

Very interesting features of the agreement between the nations are that the contributory Governments have agreed to furnish detailed information on the food production situation in their own countries and have agreed to place before the bar of world opinion, reports on the steps which they have taken to raise levels of nutritional standards of living, of production, and of distribution among their own peoples. The Organisation will collect, analyse, interpret, and disseminate information on the reports which it receives or which it may secure on its own initiative.

Full recognition will be given to the need for measures for conserving fertility of the soil—the most basic of all resources. Emphasis will be directed to the necessity for utilisation of measures necessary to maintain the health of crops and livestock, and the measures necessary to prevent deterioration and wastage in agricultural commodities after they have been produced. The F.A.O. will be especially concerned with the betterment of conditions of rural communities throughout the world.

Conference Dealt with Real Issues.

The impression gained was that the conference came to grips with the real issues involved in promoting an expanding world economy.

Delegates to the conference came from practically every part of the globe—from China to Peru, from the Scandinavian countries, from India, from Canada, from the United States, the United Kingdom and many other countries. The Commonwealth Government of Australia was the first Government of all to ratify its adherence to the Constitution of the Organisation, and it is recognised that Australia, as a great primary producing country, has a very real

and practical interest in the success of the conference.

It is realised that the objective of the Organisation cannot be reached in a day, but it is agreed that, soundly attacked, the problems of production and distribution can eventually be solved on an international basis, but that they can only be solved by that full measure of international co-operation which all contributory Governments have now pledged themselves to provide.

Why Australia Joined the F.A.O.

Australia joined the Food and Agriculture Organisation because it believes in the principles on which the Organisation has been established. In addition to the humanitarian aspects of the proposals to raise living standards among the peoples of the United Nations and ultimately among the peoples of the world, there are sound, practical reasons which have justified Australia's action in becoming a member of the Organisation.

Dr. R. J. Noble addressing a Press Conference at the Quebec F.A.O. Conference.

Australia believes firmly in the principle of co-operation. Our war-time experiences have once again demonstrated that no one community, State, or nation can live in isolation and survive. During the war, greatly increased demands were made upon our primary producers, who not only had lost approximately one-third of their manpower. but who were also seriously deprived of fertiliser, equipment and other resources. These demands for increased production could not have been met had there not been active co-operation between individuals and communities in making the best use of all the resources available to them. The same principles, at least, should apply in international relationships.

However, perhaps the main reason why Australia and many other nations joined the F.A.O. was the realisation that progress towards its objective of freedom from want would play an important part in ensuring the continued peace of the world.

What Australia Expects to Contribute to F.A.O.

Privilege of any kind should always involve a measure of responsibility. We were all prepared to pay the price involved in sacrifice and suffering for the privilege of victory in war, for our liberation from the threat of oppression, and for freedom itself.

It is perhaps harder to realise that positive action is required if the peace of the world is to be preserved.

Australia has agreed to maintain and develop her efforts to improve levels of nutrition, and to continue her work in research and in education towards improvement of production methods.

We believe that standards in Australia in this connection are fairly high, but there is still room for improvement. The work of F.A.O. cannot be effective unless all contributory nations continuously supply information on the actual position in each nation, so that a pool of information is available in matters relating to production, distribution and nutrition. Australia will supply this information in relation to its own areas. It will give most sympathetic consideration to proposals relating to training of personnel required for work in agricultural production and distribution problems as well as on matters related to nutrition.

What Australia Expects to get out of F.A.O.

Australia will share in benefits which may be secured only in a world at peace, and will share with all other nations, also, the benefits which should follow what is known as an expanding economy.

This is a large country, vitally concerned with the export of agricultural products. There can be no continuing production unless there is demand. An improved world demand for agricultural foodstuffs based on a policy of freedom from want of food among peoples of the world should be of advantage to Australia.

The problem of economic production and distribution of foodstuffs is not an easy one to solve. Nor can it be solved quickly. The reports which will be furnished by F.A.O. on the production position, on the volume and type of foodstuffs required to meet the needs of the peoples of the world, the research by F.A.O. on matters relating to distribution of agricultural products, the formulation of proposals to promote stability in rural incomes and to promote the welfare of primary producers, are all measures which cannot fail to be of value to Australia as, indeed they should be, also to all members of the United Nations.

Official Recordings of the Department's Herds.

273 Day's Recording Completed during November, 1945.

Cow.	Sire.	Owner.	Age at beginning of test. yrs. mths.	Milk. lb.	Average test. per cent.	Butter fat.
		Australian Illawarra Shorthorn				
Senior 3 years—						
Grafton Flower ...	Fairholm Mollison ...	Grafton Experiment Farm...	3 10	6,133½	3·7	228·23
		Guernsey.				
Mature Cows—						
Wollongbar Jonquil 3rd ...	Valentine's Galore 4th of Maple Lodge.	Wollongbar Experiment Farm.	5 7	9,894	5·3	520·52
Wollongbar Molly 4th ...	Wollongbar Warrior ...	,, ,, ...	6 10	7,980	5·4	430·53
Wollongbar Molly 3rd ...	Wollongbar Brutus ...	,, ,, ...	9 7	8,533½	4·9	418·45
Wollongbar Dot 2nd ...	Valentine's Galore 4th of Maple Lodge.	Bathurst Experiment Farm	6 9	6,505½	5·2	334·30
Senior 4 years—						
Wollongbar Vera ...	Valentine's Galore 4th of Maple Lodge.	Wollongbar Experiment Farm.	4 7	7,162½	5·6	402·95
Wollongbar Charm ...	May Rose's Laddie 3rd of the Masse.	,, ,, ...	4 11	8,367	4·7	393·97
		Jersey.				
Mature Cows—						
Richmond Junelle 2nd ...	Richmond Observer ...	Hawkesbury Agricultural College.	8 3	9,171¾	5·0	458·09
Richmond Wildflower 3rd	Richmond Standard ...	,, ,, ...	7 11	7,676½	5·7	435·87
New England Bubbles 4th	Dreaming Peter ...	New England Experiment Farm.	5 7	6,325½	5·3	337·91
Junior 3 years—						
Richmond Cooee ...	Richmond Volunteer ...	Hawkesbury Agricultural College.	3 5	6,195	5·2	324·71

THE RENOVATION OF CITRUS TREES

By the Supply of Nutrients, Moisture, and Conditions Congenial for Absorption.

R. J. BENTON,
Special Fruit Instructor.

Fig. 1.—A Tree in Need of Renovation—Pruning and Manuring.

IN practically every citrus orchard in New South Wales some of the trees show obvious signs of poor condition and of the need for renovation. They are thinly foliaged and show little or no vigorous growth, while production of fruit is insignificant, and what fruit is carried is of unsatisfactory size and quality.

Productive citrus trees demand sufficient nutrients and soil moisture (to transmit the nutrients of the trees) and conditions which are congenial for absorption. Any factor which precludes these requirements being met, results in disappointing yields.

It is the purpose of this article to set out the causes of poor condition in citrus trees and to indicate the measures which should be taken to rejuvenate the trees and maintain them in good condition.

It is probable that the need for renovation has arisen from one or more of the following causes:

(1) Defective drainage.
(2) Erosion of surface soil.
(3) Poor cultural practices.
(4) Insufficient or unsuitable fertilizer.
(5) Faulty irrigation practices.
(6) Difficulties in meeting requirements of aged trees for fertility and moisture.

Although it is possible that only one of these causes may account for this wastage, it often happens that all or several of them may be evident in one orchard.

First Determine the Cause of Decline.

The determination of the reasons for the decline of trees is obviously of major importance, for on this depends the remedial measures to be applied.

Frequently one finds growers pruning trees in this degenerated condition, for they are anxious to remove the dead wood. This operation, however, is a sheer waste of labour at this time, for the debilitated tree cannot respond, and it is not long before further dying back of wood occurs, resulting in the trees getting into a worse plight.

Pruning can be very helpful in restoring trees to a better and more productive condition, but it should be deferred until the cause of unthriftiness is determined, and some response has been obtained from the necessary treatment.

It may become necessary to rejuvenate trees at any time after they have become established, and renovation may prove quite economical until the trees attain considerable age—even after reaching forty years or more.

Nitrogen.—Long experience has indicated that large citrus trees each need at least 2 lb. of nitrogen a year; smaller trees require proportionately less. Whilst some soils can supply part of this amount, average soils demand this application in the form of fertilizer.

Nitrogen is available in many forms. The principal kinds normally available are sulphate of ammonia (which contains about 20 per cent. nitrogen), nitrate of soda (about 16 per cent.), and dried blood (supplying approximately 12 per cent. nitrogen). Other fertilizers such as blood, bone and offal, bonedust, castor meal, etc., also contain nitrogen, ranging from 7 to 3½ per cent., and in addition small amounts of other plant foods. It does not appear to matter what form nitrogen is supplied in, but as indicated, it is most important to know the analysis of the kind used, to ensure that the quantity necessary is applied.

For instance, if 2 lb. of nitrogen is required, and it is being given in the form of blood and bone at 5 per cent. nitrogen, 40 lb. must be applied. If sulphate of ammonia is used (20 per cent. nitrogen), only 10 lb. will be needed to supply an equivalent amount.

Availability of nitrogen from these sources varies greatly from immediately after application (if soil moisture is satisfactory) in the case of nitrate of soda, to a few weeks in the case of sulphate of ammonia, and somewhat slower availability from blood and bone, castor meal, etc.

Phosphates.—There is no doubt that phospheric acid is essential to citrus production, but its direct application to trees for long periods and even in large amounts does not show any definite result. However, the growth of weeds or cover crops obviously benefits from its application, and as those crops are of value to the soil and the trees, it is advisable to use phosphatic fertilizers for that purpose. From 1 to 2 cwt. per acre should be used at the time of crop planting (usually autumn).

Potash.—Application of this essential tree and plant food is even less spectacular than phosphoric acid in its influence on weeds and trees. Even when withheld for many years on loam and clay loam soils the effect does not appear to be detrimental, the trees in such soils apparently obtaining their requirements from the land. In lighter soils, however, especially in coastal areas, potash must be considered an essential, and applications of 2 cwt. per acre a year, of a fertiliser containing potash, are advisable.

Time of Application.—After soils have become more fertile as a result of fertilizing and better management, it does not appear to matter when the nitrogen and potash are applied. Until soils are enriched, however, application should be made by early spring. If crops are grown during summer, further applications should be provided for, by dividing the total annual quantity. The larger portion, however, should be applied in late winter, or in spring, if the form of nitrogen is very soluble.

Placement of Fertilizer.—For cover crop purposes and production of weed growth, phosphatic fertilizers should be used on the land cultivated. Trees needing renovation, however, are likely to have an impaired root system. The best and most active roots are usually beneath the tree foliage. Nitrogenous manures should, therefore, be largely applied under the trees. When healthy root fibre is apparent outside the foliage of the trees, fertilizers should also be supplied in that area. It is important that the fertilizers should at all times be distributed evenly and in proximity to effective roots, otherwise little benefit will result; it is thus necessary to know where effective roots exist.

Organic Manures.

Orchards which have been cultivated for some years are likely to have a low organic matter content in the soil. This is reflected by the soil tending to "set" readily after rain, weed growth is likely to be poor, and difficulty in growing satisfactory cover crops is likely. Application of organic manures (cow, horse, sheep, poultry, etc.) at the rate of from 3 to 10 tons per acre is an excellent investment under such conditions.

Lime.

Lime is of value in improving very acid soil conditions, and maintaining good growing conditions. The continued use of certain fertilizers like sulphate of ammonia, gradually results in an increase of acidity. Unless this action is prevented by liming the land occasionally an application of at least 10 cwt. agricultural lime in alternate years is advisable in all coastal soils. Most


FARMERS
REAP THE BENEFIT OF
BETTER LUBRICATION

inland soils approach an alkaline state, and liming to prevent development of acidity is not required.

In light soils in coastal areas, symptoms of magnesium deficiency are not uncommon; in these areas dolomite should be used occasionally in preference to agricultural lime, and at the same rate.

Fig. 5.—Emperor Mandarin Well Thinned Out and Lightly Headed to Promote New Growth.

Pruning.

Citrus trees in need of renovation, despite the fact that they are given assistance in the direction previously indicated, can only be expected to make a gradual recovery and this period may persist for several years. Pruning can be of great assistance in reducing the length of this unprofitable time. This invigorating effect on trees well supplied with fertilizers and the elimination of much diseased wood, which in turn results in stimulating growth, are very encouraging to the grower.

How to prune.—If trees are unproductive and weak, heavy pruning is desirable, whilst a modified system can be recommended where trees are less in need of renovation. The method suggested is the same, only varying in its severity of application. A good rule to follow is to err on the side of hard pruning.

First, select the principal limbs or skeleton, ensuring that all limbs retained are as well spaced as possible and do not crowd or cross one another. Next, remove all side growths from the limbs retained. Then shorten back the limbs lightly or severely.

Where trees are in somewhat better condition—while reasonably productive but obviously weakening—less severe pruning is necessary. A heavy thinning out of limbs and weak laterals along the limbs will ensure sufficient light entering the trees to induce the new vigorous shoots so essential to satisfactory bearing of fruit.

When to prune.—Trees pruned in early spring make the most rapid response, and this work may continue until the end of October in most districts, and up to December in localities where summer rainfall is satisfactory and winter frosts not severe.

After treatment.—Immediately after pruning the trees should be sprayed with lime sulphur (1 to 10 or 15) with some addition of lime to kill moss, lichen, louse, etc., and to prevent sunburn. A few weeks later, young shoots should break in abundance all along the limbs. These growths should not be thinned. Gradually occasional shoots will become much more vigorous than adjacent shoots. The vigorous shoots can be depended on to form a well-shaped tree, although an occasional one may need removing or bending over to a drooping position because of being too closely situated to another strong shoot, or on account of it crossing another. The weaker shoots in the meantime will commence to blossom and bear fruit, and many, being

Fig. 6.—Faulty Irrigation Facilities Cause Much Decline of Citrus Tree Health.

so crowded, will actually prune themselves by gradually dying.

Excessive thinning and pruning off of heavy, leafy twigs has a weakening effect on trees, and a minimum of leaf reduction is desirable on trees in an otherwise satisfactory condition.

Treatment of old trees.—Where irrigation is not possible, it is often difficult to meet the requirements of old trees which have been developed to a large size. Drought conditions with consequent lack of moisture, frequently preclude these trees from using nutrients supplied. As a result growth is rather intermittent and influenced by effective rains, which cause production of much "second crop" fruit, and much subdivision of lateral growth. This condition is accentuated by planting the trees too close together. Where this condition obtains, a reduction of trees' size by pruning is advisable.

Trees under Irrigation.

After years of cultivation, the condition of irrigated soils deteriorates, and they lose their original characteristic of readily absorbing water and of satisfactory lateral penetration of moisture. Trees are apt to depreciate rapidly, and need renovation in these circumstances. Generally, tree decline follows the practice of over generous watering. Much of the tree's root system is injured by root rotting organisms induced by maintenance of the subsoils in a continuously moist condition.

A severe reduction of the tree's top by pruning will temporarily restore balance between roots and tree top, but the response is only likely to be temporary, unless the underlying cause is remedied. Lighter applications of water should be made and the period between applications lengthened as much as possible. The need for water should be determined as a result of testing the soil for moisture by boring at several places. Irrigations should not be applied before a fairly dry soil condition is reached in the root zone area. If increased, soil moisture occurs at a greater depth, care should be taken to prevent the superficial application of water penetrating to a depth to meet the very moist soil at lower levels. More frequent waterings may be needed, because they must necessarily be light.

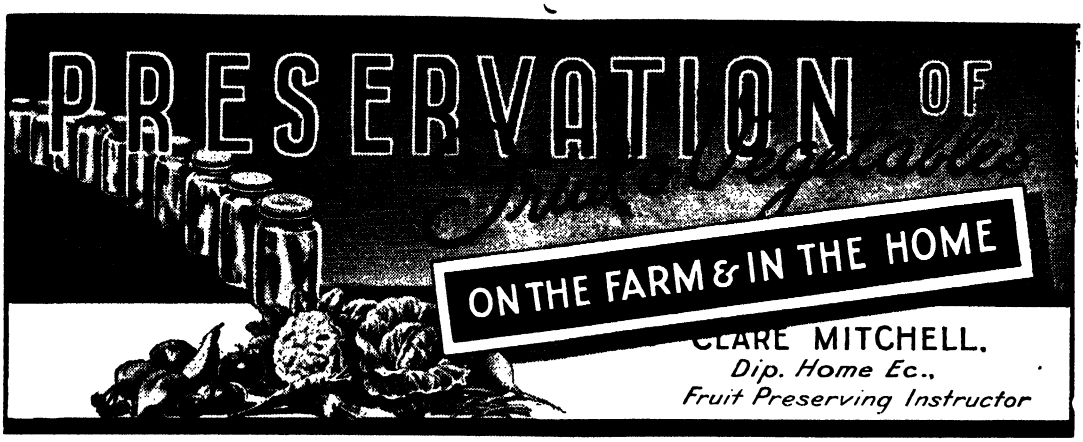
Citrus trees, particularly if on sweet orange or rough lemon stocks, prefer relatively dry soil conditions. The roots will not remain in a healthy condition for many years if a continuously moist subsoil condition is allowed to exist.

Agricultural Societies' Shows.

SECRETARIES are invited to forward for insertion in this list dates of their forthcoming shows; these should reach the Editor, Department of Agriculture, Box 36A, G.P.O., Sydney, not later than the 15th of the month previous to issue. Alteration of dates should be notified at once.

1946.

Moruya	February 13, 14
Guyra	February 15, 16
Pambula	February 15, 16
Newcastle (P. G. Legoe)	February 20, 21, 22, 23
Dorrigo and Guy Fawkes (C. C. Dean)	February 21, 22
Glen Innes	February 21, 22
Braidwood	February 22, 23
Candelo	February 22, 23
Walcha	February 26, 27
Tenterfield	February 26, 27, 28
Comboyne	February 28, March 1
Bega	February 28, March 1, 2
West Maitland (Montie Brown)	February 28, March 1, 2
Uralla	March 1, 2
Queanbeyan (D. Vest)	March 1, 2
Moss Vale (A. E. Summers)	March 1, 2
Gulgong	March 2
Tumut (T. E. Wilkinson)	March 5, 6
Jingellic (R. Langshaw)	March 6
Cobargo	March 6, 7
Cooma	March 6, 7
Taralga (L. Alders)	March 7, 8
Wingham	March 7, 8
Armidale	March 7, 8, 9
Gunning	March 8, 9
Mudgee	March 9
Tumbarumba (Violet O'Shea)	March 12, 13
Bombala	March 13, 14
Delegate	March 20, 21
Yass (H. B. Robertson)	April 4, 5
Gloucester (R. S. Wilson)	April 9, 10
Muswellbrook (T. B. Haydon)	April 11, 12
Narrandera (T. L. Bull)	September 13, 14



The Problem of—

Fruit Rising in the Bottles

ONE of the problems which beset people who bottle fruit is that of fruit rising in the bottle. This is something which is likely to happen to almost anyone at some time.

The usual reasons for such an occurrence are as follows:—

(1) Too ripe fruit.
(2) Overcooking.
(3) Too heavy a syrup.
(4) Badly packed bottles.

To deal with each of these in turn may prove helpful.

(1) If fruit is too ripe, as it is partially cooked during the processing, it collapses, leaving the bottle incompletely filled—and so the balance rises on the syrup.

(2) Overcooking has almost the same effect, in that it drives the juice from the fruit and leaves it floating in the extra juice, as the bulk of solid matter is reduced.

(3) Too heavy a syrup will not readily be absorbed into the fruit, and is, in any case, heavier than the fruit.

(4) If the bottles are badly packed, it means that insufficient fruit is in the bottle, and as the fruit loosens a little on cooking, it rises. Perhaps "badly" is the wrong word to use, but this fault is liable to occur when one is packing a number of jars in a hurry.

All these faults are within the control of the operator. However, one can select fruit which is not too ripe, use a medium syrup, pack the fruit carefully and not overcook it, and still find that the fruit can rise in the bottle. So another cause must be sought.

What Happens in Preserving.

This is found readily if one examines what happens in preserving. The object of preserving is to heat the fruit sufficiently to destroy bacteria and seal the jars. In this process, air must be driven from the fruit tissue to be replaced by the syrup. As the air is driven out, the fruit expands a little and if there is not sufficient room for it to expand, it will press against the lid or sides of the jar, and then collapse. Also the syrup or water in the bottle must be close enough to the fruit to allow the exchange of air for syrup to take place readily.

Therefore, the jars must not be packed too tightly with fruit. If the jar is so full that only a little syrup can be added, the fruit will almost invariably "squash" and probably rise.

So pack the jars carefully and firmly, but do not have so much in the jar that the lid must be forced on. It is a good rule to pack the fruit to within ¼-inch of the top.

A Chart of Cooking Times.

A great variety of fruit is available now for bottling. They cannot all be dealt with individually, but the following chart of cooking times for preserving by the boiling water bath method will be found useful.

APPROXIMATE TIMES FOR PROCESSING FRUIT BY THE BOILING WATER BATH PROCESS.

Fruit.	Style of Pack.	Syrup Recommended.	Processing times at boiling point for various elevations in quart or 1 pint jars. 0–1,000 feet.	1,000–2,000 feet.	2,000–3,000 feet.
			Minutes.	Minutes.	Minutes.
Apples	Steam or boil to wilt	Water or light	15	18	21
	Bake or boil whole, pack hot	Light ...	10	12	14
	Apple sauce, pack hot	....	10	12	14
Apricots	Packed raw with boiling syrup ...	Medium ...	25	30	35
	Boil with syrup 3–4 minutes	,, ...	15	18	21
Berries					
Blackberries, Loganberries, Mulberries, Raspberries, Gooseberries	Pack raw, cover with boiling syrup ...	,, ...	20	25	30
	Boil 3–4 minutes with equal weight sugar, stand over night, pack hot.	In own syrup	10	12	14
Cherries	Pack raw, cover with boiling syrup ...	Medium ...	25	30	35
	Precook, pack hot	,, ...	15	18	21
Peaches	Pack raw, cover with boiling syrup—				
	Clingstones	,, ...	35	40	48
	Slipstones	,, ...	25	30	35
	Precook, pack hot	,, ...	15	18	21
Pears	Pack raw, cover with boiling syrup ...	,, ...	25	30	35
	Precook 6 minutes, pack hot	,, ...	20	25	30
Pineapple	Precook in water for 8–10 minutes ...	,, ...	20	25	30
Plums	Pack raw, cover with boiling syrup ...	,, ...	15–20	20–25	25–30
	Precook, pack hot	In own juice	10	12	14
Rhubarb	Precook, pack hot (not necessary to use sugar).	,, ...	10	12	14
Tomatoes	Peel, pack raw, cover with hot brine ...	Brine or own juice.	45	55	65
	Peel, simmer 8 minutes, pack hot ...	1 teaspoonful salt in own juice.	10	12	14

Due to the varying degrees at which water boils at altitudes of 1,000 feet and over, adjustment have been made to times—20 per cent. increase for every 1,000 feet.

Making Silage on the Upper Hunter.

(*Continued from page* 61.)

be filled on these properties. When this cost is compared with drought time prices of from £3 10s. per ton for green fodder to as high as £17 10s. per ton for hay, it will be seen that the silage is a good investment. In addition those farmers who were able to co-operate in the scheme will not be without fodder for their stock when a dry time comes again and the crops and pastures fail to provide sufficient feed.

FRUIT GROWING.

BORON DEFICIENCY IN APPLES

Observations at New England Experiment Farm

(*Continued from page* 21.)

J. A. HOLBECHE, H.D.A., Fruit Instructor.

THIS is the second portion of this article—the first, which dealt with the symptoms of boron deficiency, having appeared in January issue. This month the author discusses the results of experiments designed to gather information on the effects of the application of borax to the soil.

Experiments at New England Experiment Farm.

The experiments conducted in the Kentucky district of New South Wales, where excellent results were obtained with soil dressings of borax for the control of cork are fully explained and illustrated in the July and August 1937 issues of the *Agricultural Gazette*, in an article by C. G. Savage and H. Broadfoot. Following on the results obtained at Kentucky, extensive experimental plots were established in the New England Experiment Farm orchard, where for a number of years previously apples had been severely affected with corking.

Investigations were commenced in 1937, and plots designed with the object of gaining further information concerning—

(*a*) In the case of soil treatments with borax:

1. Method of application.
2. When to apply.
3. Quantity to apply.
4. Period of effectiveness.
5. Effects of applying excessive quantities of borax to the soil.

(*b*) In the case of spray applications of borax to the foliage:

1. When to apply.
2. Quantity of borax to apply.
3. Effects of combining other sprays with borax.

Material Used and Method of Application.

Commercial powdered borax containing approximately 11 per cent. boron was used in all experiments. As a soil dressing, it was distributed evenly around each tree in a circle commencing at least 2 feet out from the butt. As far as possible, depending on the amount of borax applied, an effort was made to encircle each treated tree completely with a 2-feet wide band of borax. Except where specially mentioned all borax was lightly hoed into the soil immediately after it had been applied to the surface.

Powdered borax was also used in all cases where borax sprays were applied to the trees. Some difficulty may be experienced in mixing the borax, and it is desirable to dissolve the required amount in a suitable quantity of hot water before adding to the spray tank. This concentrated borax solution is added to the spray tank of water, with the agitators moving. In all the Glen Innes treatments the borax solution was added to the spray tank of water first, and then any other mixture required followed. As far as it was practical to do so, every effort was made to prevent the spray solution run off, at time of application, from entering the soil by way of the tree trunk.

Fig. 6.—Jonathan Apples showing Cork.

Method of Recording Results.

In all plots, fruits from trees which received no treatment were used as a basis for judging the effects of the various treatments.

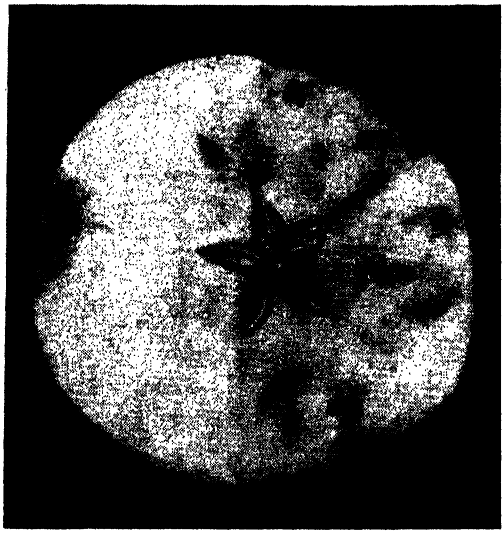


Fig. 7.—Jonathan showing Internal Cork

Two methods of recording results were adopted—

(*a*) *Examination of Fruit after Harvesting.*—Fifty fruits were picked at random out of the crop harvested from each individual tree included in the experiments. These fruits were taken as a fair average sample of the tree crop. Each fruit was then cut many times in cross sections and the observations recorded.

(*b*) *Examination of Trees and Fruits in the Field.*—All trees were closely examined at frequent intervals throughout the season. Special attention was directed to such matters as the condition of the foliage, lateral growth and presence of cork in growing fruits.

In these records and particularly in the tabular statements, internal cork and corky core include all fruits which from outside appearances are normal. The internal cork is confined mainly to Granny Smiths and the corky core to Jonathans. Crinkle is confined to Granny Smiths which are distorted through cork restricting growth early in the season and superficial cork is confined wholly to Jonathans and includes fruits which are also affected with cork and corky core. All fruits included under the heading superficial cork show some surface abnormality.

Applications of Borax to the Soil.

Experiment No. 1 (*Quantity of Borax*)—In experiments designed to obtain information on the quantity of borax to apply, period of effectiveness and effects of applying each year, the following trees were used:—

1. Variety.—Granny Smith.
   Soil Type.—Dark brown medium clay over dark brown heavy clay.
   Age.—34 years.
   Average height of trees.—12 feet.
   Average spread of limbs.—14 feet.
   Average circumference of trunk.—30 inches—measurements taken 6 inches from ground level.
   Prior to commencement of treatments fruits from all trees showed slight to severe corking.
2. Variety.—Jonathan.
   Soil type.—Grey brown heavy clay over grey brown heavy clay.
   Age.—40 years.
   Average height of trees.—10 feet.
   Average spread of limbs.—13 feet.
   Average circumference of trunk.—24 inches—measurement taken 6 inches from ground level.
   Prior to commencement of treatments fruits from all trees showed slight to medium corking.

In all plots the borax was applied to the soil during the first week of August.

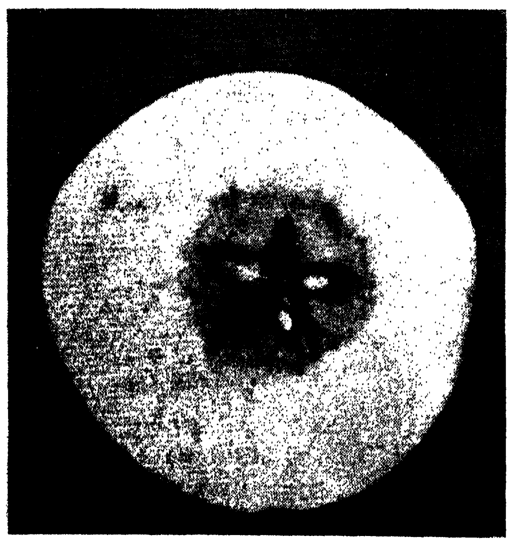


Fig. 8.—Jonathan showing Corky Core

The following table shows the average corking as a percentage for all trees in each plot for the five years 1938 to 1942.

Experiment No. 1.—Cork as a Percentage for all Trees.

Treatments.	Year Recorded.	"Internal" Cork and Corky Core.		Crinkle and "Superficial" Cork.		Total Corking.	
		Jonathan.	Granny Smith.	Jonathan.	Granny Smith.	Jonathan.	Granny Smith.
No treatment	1938	34·0	22·0	13·0	32·0	47·0	54·0
	1939	5·0	28·0	0·0	8·5	5·0	36·5
	1940	18·0	37·0	0·0	14·0	18·0	51·0
	1941	3·0	25·0	1·5	14·0	4·5	39·0
	1942	5·0	24·0	1·5	10·0	6·5	34·0
No treatment	1938	No record.	19·0	No record.	66·0	No record.	85·0
	1939	15·0	16·5	2·0	0·0	17·0	16·5
	1940	23·0	27·0	0·0	28·0	23·0	55·0
	1941	11·0	12·0	3·0	0·0	14·0	12·0
	1942	6·0	12·5	1·0	5·0	7·0	17·5
½ lb. borax applied soil, 1937 (one year only).	1938	6·5	0·0	0·5	0·0	7·0	No trace.
	1939, 1940	No trace.	......	......	......	No trace.	......
	1941	0·0	0·0	5·0	0·0	*5·0	No trace.
	1942	4·0	0·0	0·0	0·0	*4·0	No trace.
½ lb. borax applied soil 1937, 1938 and 1940 (total 1½ lb.).	1938	No record.	12·0	No record.	10·0	No record.	22·0
	1939	4·0	0·0	1·0	0·0	5·0	No trace.
	1940	0·0	1·0	0·0	0·0	No trace.	1·0
	1941	0·0	4·0	6·0	0·0	6·0	4·0
	1942	......	......	......	......	No trace.	
¾ lb. borax applied soil 1937 (one only)	1938	15·0	0·0	0·0	0·0	15·0	No trace.
	1939, 1940	No trace.	......	......	......	No trace.	
	1941	0·0	1·0	2·0	0·0	2·0	1·0
	1942	2·0	3·0	0·0	0·0	2·0	3·0
¾ lb. borax applied soil 1937, 1938 and 1940 (total 2¼ lb.).	1938	No record.	12·0	No record.	[illegible]	No record.	12·0
	1939, 1940	......	......	......	......	No trace.	
	1941	......	......	......	......	No trace.	No crop.
	1942	0·0	1·0	0·0	0·0	No trace.	1·0
1 lb. borax applied soil 1937 (one year only).	1938	6·0	1·0	3·0	0·0	9·0	†1·0
	1939	......	......	......	......	No trace.	
	1940	0·0	1·0	0·0	0·0	No trace.	1·0
	1941	......	......	......	......	No trace.	
	1942	1·0	2·0	0·0	0·0	1·0	2·0
1 lb. borax applied soil 1937, 1938 and 1940 (total 3 lb.).	1938, 1939	No trace.	......	......	......	No trace.	
	1940, 1941	No trace.	......	......	......	No crop.	
	1942	1·0	0·0	1·0	0·0	2·0	No trace.
2 lb. borax applied soil 1937 (one year only).	1938	0·0	3·0	0·0	0·0	No trace.	3·0
	1939, 1940, 1941, 1942——No further trace of corking.						
2 lb. borax applied soil 1937, 1938 and 1940 (total 6 lb.).	1938, 1939, 1940, 1941, 1942——No trace of corking.						
3 lb. borax applied soil 1937, 1938 and 1940 (total 9 lb.).	1938, 1939, 1940, 1941, 1942——No trace of corking.						
3 lb. borax applied soil 1937 (one year only).	1938, 1939, 1940, 1941——No trace of corking.						
	1942	2·0	2·0	0·0	0·0	2·0	2·0
4 lb. borax applied to soil 1937 (one year only).	1938, 1939, 1940, 1941——No trace of corking.						
	1942	2·0	0·0	0·0	0·0	2·0	No trace.
4 lb. borax applied 1937, 1938, 1940 (total 12 lb.).	1938, 1939, 1940, 1941, 1942——No trace.						

* Three years after treatment trees in this plot produced fruit (in 1941) more severely affected with cork than no treatment trees and in 1942 showed 4 per cent. corking compared with 6·5 per cent. where not treated.

† Fruit from one tree only affected.

Average (as Percentages) from All Plots or First Year Recorded.

Treatment.	Total of Fruits Affected with Corking.	Plots Treated 1937 Only. Number of Years of Complete Control in Five-year Period after Treatment.	
		Jonathan.	Granny Smith.
	per cent.		
No treatment	62·0	Nil.	Nil.
½ lb. borax	9·6	2	5
¾ lb. borax	9·0	2	3
1 lb. borax	2·5	3	2
2 lb. borax	0·75	5	4
3 lb. borax	1·0	4	4
4 lb. borax	0·5	4	5

Most effective control for the first year was obtained when trees received a dressing of borax at the rate of 1 lb. or more. Quite good control was obtained where trees received ½ and ¾ lb. borax although there is a tendency for the fruits to show a fair percentage of cork during the first year after treatment.

It is shown that the borax is effective in completely controlling cork, for periods of from two to five years after treatment. The very low percentage of cork recorded for any period to date, however, indicates that fairly effective control can be expected for at least five years after treatment.

No advantage is gained by applying borax each year, and there is always the danger that in doing so, much damage to trees and fruit may occur.

The results recorded therefore, indicate that an application of 1 lb. of borax to the soil is quite effective in controlling cork. This amount applied once can be expected to give good control for at least five years.

Experiment No. 2 (Time of Application).—Another experiment designed to determine the time to apply, and period of effectiveness of borax, was conducted with trees as follows:—

1. Variety.—Granny Smith.

   Soil Type.—Grey brown medium clay over grey brown heavy clay.

   Age.—40 years.

   Average height of trees.—12 feet.

   Average spread of limbs.—15 feet.

   Average circumference of trunk.—31 inches—measurements taken 6 inches above ground level.

   Prior to commencement of treatments fruits from all trees were severely to very severely affected with cork.

2. Variety.—Jonathan.

   Soil type.—Grey brown heavy clay over grey brown heavy clay.

   Age.—34 years.

   Average height of trees.—10 feet.

   Average spread of limbs.—14 feet.

   Average circumference of trunk.—21 inches—measurements taken 6 inches above ground level.

   Prior to commencement of treatments fruits from most trees showed a medium amount of corking.

Borax at the rate of 1 lb. was applied to the soil around each tree during the first week of each of the months June to September in 1937 only.

The average corking during the period 1938 to 1942, shown as a percentage of each plot, was as follows:—

Experiment No. 2.—Average Corking as a Percentage for each Plot.

Time of Treatment.	Year Recorded.	Internal Cork and Corky Core.		Crinkle and Superficial Cork.		Total Corking.	
		Jonathan.	Granny Smith.	Jonathan.	Granny Smith.	Jonathan.	Granny Smith.
		per cent.	per cent.	per cent.	per cent.	per cent.	per cent.
No treatment	1938	53·5	31·0	17·0	44·0	70·5	75·0
	1939	23·0	19·5	3·0	0·5	26·0	20·0
	1940	66·0	29·0	5·0	34·0	71·0	63·0
	1941	39·0	27·0	8·0	2·0	47·0	29·0
	1942	24·0	15·5	12·0	6·5	36·0	22·0
1 lb. borax in June, 1937	1938	10·0	No trace.	2·0	0·75	12·0	0·75
	1939	No trace.	No trace.	No trace.	No trace.	Nil.	Nil.
	1940	No trace.	No trace.	No trace.	No trace.	Nil.	Nil.
	1941	2·0	No trace.	No trace.	No trace.	2·0	Nil.
	1942	3·0	1·0	No trace.	No trace.	3·0	1·0
1 lb. borax in July, 1937	1938	5·5	4·0	1·5	1·5	7·0	5·5
	1939	No trace.	No trace.	No trace.	No trace.	Nil.	Nil.
	1940	1·0	No trace.	No trace.	No trace.	1·0	Nil.
	1941	2·0	No trace.	No trace.	No trace.	2·0	Nil.
	1942	1·0	1·0	No trace.	No trace.	1·0	1·0
1 lb. borax in August, 1937	1938	3·5	2·0	0·5	3·0	4·0	5·0
	1939	No trace.	No trace.	No trace.	No trace.	Nil.	Nil.
	1940	No trace.	6·0	No trace.	1·0	Nil.	7·0
	1941	1·5	No trace.	0·5	No trace.	2·0	Nil.
	1942	1·75	0·4	No trace.	No trace.	1·75	0·4
1 lb. borax in September, 1937 ...	1938	10·0	8·0	9·0	12·0	19·0	20·0
	1939	No trace.	No trace.	No trace.	No trace.	Nil.	Nil.
	1940	No trace.	No trace.	No trace.	No trace.	Nil.	Nil.
	1941	1·0	No trace.	No trace.	No trace.	1·0	Nil.
	1942	1·0	1·5	0·5	No trace.	1·5	1·5

The following table shows the number of trees producing affected fruit in each plot one year and five years after treatment.

Number of Trees Producing Affected Fruit.

Variety.	Month Treated.	No. of Trees in Plot.	No. of Trees which Produced Affected Fruits.	Average Percentage of All Affected Fruits.	Highest Percentage of Corky Fruit on One Tree.
	One Year after Treatment (1938).				
				per cent.	per cent.
Granny Smith	June, 1937	11	1	0·75	8·0
	July, 1937	11	5	5·5	30·0
	August, 1937	11	4	5·0	22·0
	September, 1937 ...	11	10	20·0	84·0
	No treatment	23	23	75·0	100·0
Jonathan	June, 1937	7	5	12·0	50·0
	July, 1937	9	6	7·0	18·0
	August, 1937	9	5	4·0	14·0
	September, 1937 ...	9	9	19·0	38·0
	No treatment	14	14	70·5	100·0
	Five Years after Treatment (1942).				
Granny Smith	June, 1937	8	4	1·0	4·0
	July, 1937	7	0	Nil.	Nil.
	August, 1937	9	2	0·4	2·0
	September, 1937 ...	9	3	1·5	4·0
	No treatment	18	17	22·0	60·0
Jonathan	June, 1937	9	6	3·0	18·0
	July, 1937	9	3	1·0	5·0
	August, 1937	8	5	1·75	4·0
	September, 1937 ...	9	3	1·5	8·0
	No treatment	18	18	36·0	90·0

Variations in the numbers of trees in the plots between 1938 and 1942 are due to crop failures.

The rainfall recorded in 1937 for the months of June to October inclusive, was approximately up to the average. The recording in July was the lowest of any month, while most of the September rain fell before the borax was applied. However, it could be expected that in most seasons the results would coincide with those recorded in the above experiment.

It is indicated that the most suitable period to apply borax to soil for the effective control of cork is during the months of June, July and August. Under average conditions a September application is likely to result in only fair control being obtained.

Experiment No. 3 (Method of Application).—An experiment to determine the best method of applying and period of effectiveness of borax was conducted with trees as follows:—

Variety.—Granny Smith.

Soil type.—Brownish grey concretionary light clay over brownish grey light clay.

Age.—26 years.

Average height of trees.—13 feet.

Average spread of limbs.—12 feet.

Average circumference of trunk.—31 inches—measurements taken 6 inches above ground level.

All treated trees received 1 lb. borax during the first week of August, 1937, only, the borax being hoed into the soil in one plot, and not hoed in the other.

The rainfall registered during the months of August to November inclusive, was approximately up to the average amounts recorded over a number of years for this period.

Experiment No. 3.—Average Corking as a Percentage for Each Plot.

Treatment.	Year Recorded.	Internal Cork.	Crinkle Cork.	Total Corking.	No. of Trees in Plot.	No. of Trees which Produced Affected Fruits.	Highest Percentage of Corky Fruit on One Tree.
		per cent.	per cent.	per cent.			per cent.
No treatment	1938	8·0	65·25	73·25	8	8	100·0
	1939	16·5	1·0	17·5	9	8	90·0
	1940	26·0	25·0	51·0	10	10	92·0
	1941	33·0	9·0	42·0	9	6	96·0
	1942	20·5	23·0	43·5	10	9	98·0
Borax hoed into the soil	1938	1·5	7·25	8·75	8	6	34·0
	1939	No trace.	......	Nil.	8	0	Nil.
	1940	0·25	......	0·25	8	1	2·0
	1941	No trace.	......	Nil.	8	0	Nil.
	1942	0·25	No trace.	0·25	8	1	2·0
Borax not hoed into the soil... ...	1938	7·5	13·75	21·25	8	8	56·0
	1939 }	No trace.	......	{ Nil.	8	0	Nil.
	1940 }			{ Nil.	8	0	Nil.
	1941	2·25	No trace.	2·25	8	1	18·0
	1942	No trace.	......	Nil.	8	0	Nil.

A distinct advantage from the practice of hoeing borax into the soil immediately after applying is indicated by the percentage of corky fruits recorded in the various plots.

(To be continued.)

BETTER and heavier feeding means increased expenditure on pasture improvement, fodder crop production and concentrates, and it might be argued that the increased production may not pay; but although higher production definitely requires more feed, the amount of feed required *per gallon* and therefore *the cost of production per gallon* is less. That is, high-producing cattle convert feed to milk more efficiently than do low-producing cattle.

For example, a 4-gallon cow requires about one and a half times as much feed as a 2-gallon cow, but produces twice as much milk. In an American farm survey it was found that the cost of feeding cattle on farms producing 250 lb. of butter-fat per cow was one and a half times the cost of feeding cattle on farms with an average of 150 lb. However, on the 250-lb. farms the net return, that is, gross returns minus feed costs, was *four times greater* than on the 150-lb. farms.

The Cool Storage of Peaches and Pears for Canning

To Extend the Season.

E. G. HALL, B.Sc.Agr., Fruit Research Officer.

THE canning of clingstone peaches and Williams pears is an important industry in New South Wales and Victoria. It is generally necessary to hold considerable quantities of fruit in cool storage to extend the canning season, so that the canneries can handle as much as possible of the fruit available. In the case of pears, cool storage offers other advantages; Williams pears, for instance, will not ripen to good quality on the tree, and best quality is only attained after a period of cool storage followed by ripening at a suitable temperature. Moreover, pears ripen more uniformly after removal from cool storage than when ripened off the tree.

For a number of years experiments have been carried out on the storage of peaches and pears, and in one year this was followed up with commercial scale canning trials of fruit from the storage experiments. It is considered that the results of this preliminary work will be of interest to canners because of the importance to them of cool storage. It will be necessary, however, to carry out further investigations to confirm the tentative recommendations given hereunder.

Peaches.

Storage experiments have been conducted with the Golden Queen and Phillips Cling varieties, and canning tests were carried out with Golden Queens only.

In the canning trade the maturity of cling peaches is usually described as either "canning" or "off canning," the latter being less mature than the former. Fruit of these two maturity classes was obtained from the Murrumbidgee Irrigation Area and stored in the experimental cool storage rooms at the Food Preservation Laboratories, Homebush.

The "off canning" fruit was slightly harder on arrival at the laboratory than the fruit picked at the "canning" stage, had a slightly higher acidity and when ripened immediately at 65 deg. Fahr., had a poorer flavour than the more mature fruit. Usual figures for firmness on arrival, as measured on peeled fruit with the standard U.S. pressure tester fitted with a 5/16 inch diameter plunger were—"off canning" 10 to 13 lb.; "canning" 9 to 11 lb.

In the storage tests, as judged by condition of the fresh fruit, the life at 32 deg. Fahr., was three weeks for both maturities of Golden Queens and one to two weeks longer for the Phillips Cling variety. The storage life was not affected by maturity, but was reduced by one week when the storage temperature was raised to 34 deg. Fahr. In one year a storage temperature of 30 deg. Fahr. was also used with both J. H. Hale and Golden Queen varieties and better results were obtained than at 32 deg. Fahr.

The Effect of Storage Treatments on the Yield and Quality.

For this experiment Golden Queen peaches were picked at Griffith on 11th March, 1940, and separated into "off-canning" and "canning" grades. The fruit was received at this laboratory on the following day and samples were placed in air storage at 30 deg. and 32 deg. Fahr., and in 5 per cent. CO_2, 16 per cent. O_2, and 10 per cent. CO_2, 11 per cent. O_2 at 32 deg. Fahr. Samples of the "off-canning" grade were also delayed for one and two days at atmospheric temperatures before being stored in air at 32 deg. Fahr.

Bushel lots of fruit stored without delay were removed after 2, 3, 4 and 5 weeks from air storage at 30 deg. and 32 deg. Fahr, and canned under commercial conditions. Only one removal after five weeks was made of delayed and gas-stored fruit. The fruit was canned as halves to local pack standards.

The normal yield in canning for the local trade is about 64 per cent. of the fresh weight, losses being due to peeling, pitting, trimming, and rejection of inferior fruit. In the experimental lots pieces were rejected as being unsuitable for canning if they had dark centres, ragged edges, bruises or other blemishes. The amount of fruit in-

volved was only about 40 lb. and consequently the figures obtained must be regarded with caution. The yield of the various lots is recorded in Table I.

Table I—Canning Yield of Stored Golden Queen Peaches.

Sample.				Percentage of Fruit Canned.
*R	2 weeks at	30 deg. Fahr.	...	48
†G	2 ,,	30 ,,	...	51
*R.	2 ,,	32 ,,	...	41
†G	2 ,,	32 ,,	...	56
*R	3 ,,	30 ,,	...	50
†G	3 ,,	30 ,,	...	54
*R	3 ,,	32 ,,	...	47
†G	3 ,,	32 ,,	...	54
*R	4 ,,	30 ,,	...	35
†G	4 ,,	30 ,,	...	58
*R	4 ,,	32 ,,	...	19
†G	4 ,,	32 ,,	...	25
*R	5 ,,	30 ,,	...	37
†G	5 ,,	30 ,,	...	39
*R	5 ,,	32 ,,	...	24
†G	5 ,,	32 ,,	...	All bruised.

* R = Canning maturity. † G = Off canning maturity.

The yield in all cases was lower than the 64 per cent. usually obtained commercially, but the experimental fruit was somewhat riper that that normally canned, and was handled much more, with resultant increased bruising and other trimming losses.

Fruit removed from air storage after five weeks and examined before canning was pale in colour, slightly mealy with discolouration round the stone and had an off flavour.

There was not a sufficient quantity of delayed or gas-stored fruit available to determine yields of the canned product, but after five weeks storage this fruit was discoloured and had an off flavour and very little of it was of canning quality. It will be observed from Table I that both maturities were fairly satisfactory after three weeks storage, but after four weeks the only satisfactory lot was the off canning maturity at 30 deg. Fahr.

Appearance and Quality of Canned Fruit After Storage.

Samples of the canned fruit were stored at 65 deg. Fahr, and examined for appearance and palatability after nine months and sixteen months storage respectively.

The results of the first examination can be summarised as follows:—

(1) The colour was good in all samples and the colour of the earlier removals of the "canning" stage fruit was particularly good, being an attractive golden yellow.

(2) Samples G2-30, G2-32, R3-30, G3-30, R3-32 and G3-32 were better than commercial standard.

(3) Samples R2-30, R4-30, G4-30, G4-32, G5-30, R5-32 and G5-32 were of commercial standard.

(4) The other air-stored lots were not equal to commercial standard, being generally too soft and somewhat stale in flavour due to over-ripeness.

(5) The gas-stored fruit, particularly that from 10 per cent. CO_2 was unsatisfactory, because of poor texture and the presence of off-flavours.

(6) The air-stored fruit was generally considered to be superior to the usual commercial product in colour and flavour, but softer in texture. Some people preferred the softer texture.

At the second examination it was observed that the quality of most samples had deteriorated since the first examination seven months previously. This applied particularly to samples R2-30, G2-30 and R2-32. The more rapid deterioration of this fruit (which was stored for the shortest time) and the fact that at the earlier examinations it was inferior to similar lots stored for three weeks, were probably due to the first removal from store being held for ripening at room temperatures for a few days before canning. This resulted in these lots being slightly over-ripe when canned. The later removals were sent in to the cannery as soon as they were removed from store.

At this examination the following samples were still good and equal to commercial standard:—

G2-32, R3-30, G3-30, R3-32 and G4-30.

The following lots were of fair quality and still quite palatable:—

R2-30, G2-30, G3-32, R5-32 and possibly G5-2.

The remaining samples were of poor quality being too soft and stale or off in flavour.

Summary of Peach Canning Trials.

(1) Fruit at the "off-canning" stage stored better than that at the "canning" stage; the latter fruit, however, had the better flavour and colour.

(2) Three weeks storage of "canning" stage fruit or four weeks storage of "off-canning" fruit at either 30 or 32 deg. Fahr. was satisfactory.

(3) Storage at 30 deg. Fahr., was better than storage at 32 deg. Fahr. as, in the later removals there was less wastage giving a greater yield, and the canned fruit was fresher in flavour.

(4) Gas-storage was unsatisfactory, resulting in an off-flavour quite distinct from staling due to over-ripeness.

Pears.

The storage life of William pears is greatly influenced by the maturity at picking, by delay before storage, and by the temperature of storage, and it varies somewhat according to seasonal conditions.

Pears for storage should be picked when still quite green, but not until they start to loosen on the spur—when the colour is a paler green than the deep green of immature fruit. The fruit should be hard with a firmness of 16-20 lb. as measured with the standard U.S. pressure tester fitted with the 5/16 inch diameter plunger. The fruit should be placed in storage without delay and cooled down to the storage temperature as rapidly as possible.

At 30 deg. Fahr., the life of Williams pears picked at the correct stage and stored without delay should be ten to twelve weeks; it will be about a fortnight less at 32 deg. Fahr., and at 34 deg. Fahr., the life will only be about six to eight weeks. Pears respond well to gas-storage and the storage life of Williams pears gas-stored at 32 deg. Fahr. in an atmosphere containing 5 per cent. carbon dioxide and 16 per cent. oxygen should be of the order of four months.

The Effect of Storage Treatments on the Quality of Pears for Canning.

The fruit for this experiment was picked on 20th January, 1940, at Orange and placed in storage at 30 deg. Fahr, 32 deg. Fahr. and in 5 per cent. CO_2, at 32 deg. Fahr. on 21st January, 1940. Samples of each lot were removed for canning after four, six and eight weeks storage. Half of each lot was ripened at room temperature (A) and half at 65 deg. Fahr. (C). One lot was ripened at room temperature on arrival and then canned (Ao).

The yield was in most cases quite satisfactory; in the two or three cases where it was low this was due to the fruit being ripened too long before canning.

All canned lots were satisfactory, being well up to commercial standard.

The members of the Department of Agriculture who examined the fruit reported that, on the whole, the pears were in very good condition, the best being lots cold stored for six and eight weeks, which had good appearance and texture and very good flavour. When examined at Homebush, the fruit had deteriorated in quality as it was then almost eighteen months since it was canned. Most lots had a "tinny" off-flavour, as a result of some corrosion of the tinplate. However, even then, all compared quite favourably with commercial samples recently purchased, which were rather hard in texture and weak in flavour, apparently due to being canned before the fruit was sufficiently ripe. There was no apparent improvement in quality as a result of ripening at 65 deg. Fahr., instead of at ordinary room temperature, although average room temperatures were of the order of 77-80 deg. Fahr.

From these results it seems that, provided there is no delay between picking and storage, W.B.C. pears can safely be stored for eight weeks before canning. In this experiment there were no differences between the three storage conditions, but under commercial conditions it would be safer to store at 30 deg. Fahr. instead of 32 deg. Fahr., if gas-storage is not available.

Conclusions.

(1) It is recommended that Williams pears and peaches intended for canning should be held at a temperature of 30 deg. Fahr if storage is required.

(2) Provided that Williams pears are picked when still green and hard, and placed

(Continued on page 101)

Notes on—

The Storage of Vegetables for Processing.

(*Concluded from page* 30.)

E. G. HALL, B.Sc.Agr., Fruit Research Officer.

A PROPER appreciation of the requirements for the successful storage of vegetables prior to processing, and the application of efficient methods of handling and storing would result in better use being made of these foodstuffs.

In the first section of this article, which appeared in the January number, the author dealt with general requirements for the storage of vegetables and with potatoes in particular. Other vegetables of importance for processing are dealt with in this issue.

Cabbages.

Cool Storage.—Cabbages are best stored at a temperature of 32 deg. Fahr., and a relative humidity of 90-95 per cent. If humidity control is available the humidity should be kept at about 75 per cent. for the first few days to allow rapid drying out of the outer leaves, which then act as a better protection for the head. Under these conditions, if carefully handled, late varieties should keep for about three months whereas earlier varieties will keep for only four to six weeks.

Common Storage.—Late varieties of cabbage can be common-stored without excessive loss for several weeks during the winter months in the colder areas.

General.—Cabbages for storage should be carefully selected and carefully handled. Only sound, mature, firm heads should be used; they should be cut so as to leave an inch or so of stalk after trimming off loose outer leaves. However, several good wrapper leaves should be left to protect the head. On removal from storage the heads should be trimmed again to remove loose and damaged leaves.

Good ventilation during storage is essential, and, to achieve this, the cabbages should be in crates or in small slatted bins; they should not be stored in bags which do not allow sufficient ventilation. Condensation of moisture on the heads must be prevented in order to avoid serious rotting and rapid yellowing of the leaves, which is serious if there is any "sweating" during storage.

Onions.

Cool Storage.—The best conditions for the storage of onions are a temperature of 32 deg. Fahr., and a relative humidity of 70-75 per cent. A relatively low humidity is necessary to prevent undue root growth and decay. Therefore, onions should not be stored with other produce. Under these conditions sprouting is checked and root growth retarded. The Australian Brown (Brown Spanish) and Brown Globe varieties will keep for six to seven months, and the mid-season varieties, such as Hunter River Brown and Hunter River White, should keep well for four months, while the early varieties are not suitable for cool storage for more than two months.

Common Storage.—Late brown onions will keep for four to five months in common storage in the cooler districts during the winter and early spring months, and the mid-season varieties should keep for two to three months, provided that the onions are properly handled and provided that the storage shed is dry and well ventilated.

General.—Onions for storage should be well matured, that is, they should not be pulled until the tops become brown and fall over. For storage to be successful, onions must be "cured" after harvesting, to dry out thoroughly the outer scales of the bulb. A satisfactory procedure is to dry off the onions for three or four days in windrows in the field and then top them, leaving about an inch of stalk. The final curing is then carried out in slatted crates under cover so that air circulates freely through the onions. This will require a period of about three to four weeks. After curing, the onions should be well sorted and any thick-necked, double or injured specimens removed for immediate marketing.

Onions for storage should be packed in crates, boxes or in open mesh bags which must be stacked so as to provide very good

* Also appeared in *Food Preservation Quarterly*, March/June, 1945.

air circulation. Best results are obtained when the onions are stored in an insulated storage shed and when full advantage is taken of the cool night air to keep the temperature of the onions as low as possible. The priniciple trouble in common storage is sprouting, which is kept in check at low temperatures and develops most rapidly at 60 deg. Fahr. Unless the storage atmosphere is kept dry root growth will also be serious, and unless the onions are well cured and sorted before storage, rotting may cause considerable losses.

Silver Beet.

Silver beet is very perishable and can only be held satisfactorily in cool storage. It should be stored at 32 deg. Fahr., and a relative humidity of 90-95 per cent., under which conditions it should keep fairly well for two weeks if quite fresh when placed in store. Silver beet should be stored in crates and requires very good ventilation to avoid "sweating" during storage.

Beetroot.

The best storage conditions for beetroot are a temperature of 32 deg. Fahr., and a relative humidity of 95 per cent. Beetroot tends to shrivel badly; therefore, the humidity must be kept as high as possible. Under these conditions good roots will keep for three to four months. They can be common stored for a few weeks in the colder districts but will not hold in good condition for more than a week or two under warmer conditions, mainly because of excessive shrivelling.

Before going into storage, beetroot should be topped by twisting off the tops 2 or 3 inches above the crown, and well sorted to remove all diseased or injured specimens. They should be handled very carefully and stored in slatted crates or boxes; bags are unsatisfactory and storage in large bulk should be avoided.

Swede Turnips.

Cool Storage.—Swede Turnips store well and will keep for five to six months at a temperature of 32 deg. Fahr., and a humidity of 90-95 per cent.

Common Storage.—Swedes should keep for three months in common storage during the winter and early spring in cooler areas, and under common storage can be satisfactorily handled in the same manner as potatoes.

General.—Harvesting should be done carefully; the tops should be cut closely, but trimming should be reduced to a minimum. All diseased or damaged roots should be graded-out before storage. Although they may be stored in bags, better results are obtained by the use of crates or boxes. Wilting during storage may be kept in check by occasionally applying a fine spraying of water. Sprouting is kept in check in cool storage, but in common storage, sprouting and wilting are the principal troubles. If the storage temperature is much more than 45 deg. Fahr. the development of sprouting and wilting will reduce the storage life to about two months.

Under warmer conditions, such as in Sydney during the winter, swedes will hold satisfactorily for about six weeks provided that they are stored in a cool, well ventilated spot and that steps are taken to reduce wilting.

Peas and Green Beans.

These perishable vegetables are similar in their storage requirements. Holding without refrigeration is possible for a day or two, but even then there is a serious loss of quality, especially of sugar from peas, which loss is particularly undesirable for processing. If peas or beans must be held more than a day after picking, they should be placed in cool storage. They should be stored at 32 deg. Fahr., with a relative humidity of 90-95 per cent. Under these conditions they will keep well for one to three weeks. For best results they must be young and tender, sound and dry and stored in well ventilated boxes or crates; the tropical fruit case is a very satisfactory container provided that it is firmly but not tightly filled. These vegetables are liable to sweat in storage, and therefore the use of bags is not desirable. Diseased material should not be stored.

Green Corn (Sweet Corn).

Green Corn is very perishable and should be processed within a few hours of harvesting. Even if the cobs are held at ordinary temperatures until the next day, there will be a serious loss of quality. Sweet corn

can be held at 32 deg. Fahr., with a relative humidity of 85-95 per cent. for only one week with safety and should be stored in well ventilated crates.

Tomatoes.

In order to obtain maximum colour and flavour, tomatoes for processing are usually not picked until they are coloured and firm ripe. If they have to be transported a considerable distance they must be picked less coloured in order to avoid damage in transit, but it must be remembered that the more coloured they are when picked the better will be the quality when ripe.

For longest storage, tomatoes should be picked when "mature green," and stored at 55 deg. Fahr., with a relative humidity of 85 per cent. The "mature green" stage is reached when the green skin shows a whitish tinge and a pink colour starts to show in the flesh; if picked less mature they will not ripen properly. Under these conditions they will keep for three to six weeks, depending on the quality of the fruit, the season of the year and probably on the variety. Limited experience indicates that autumn-grown tomatoes store better than those maturing earlier in the season.

Coloured fruit is best held at 45 deg. Fahr., at which temperature it should keep for two weeks. Ripe fruit may be held for a few days at 32 deg. Fahr., but should be processed within a few hours of removal.

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This article has been prepared from unpublished data, from general observations, from information supplied by colleagues and from certain published material. The latter includes the following:—

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The Scientific Liaison and Information Bureau of the Council for Scientific and Industrial Research has prepared a bibliography on vegetable storage and copies may be obtained on application to the Council's Head Office, 314 Albert-street, East Melbourne C2.

Precautions Against Deterioration of Bananas in Transit.

To preserve the carrying qualities of bananas and minimise the likelihood of the fruit arriving at market in a mixed ripe or boiled condition, it is necessary for growers to observe the following points:—

1. All possible precautions should be taken to keep the fruit cool, especially in very hot weather.

2. Fruit should on no account be left in the sun without a suitable cover. A well-ventilated shelter is necessary in which to keep bananas until picked up by the carrier.

3. The time between cutting and the departure of the train or boat should be reduced to an absolute minimum.

4. On no account should fruit showing the first signs of ripening be packed with green fruit. All ripening fruit should be rejected.

5. Bananas should be protected from the weather during transit from the plantation to the point of loading.—DIVISION OF HORTICULTURE.

Oat grain promises to be the cheapest and most easly available supplementary feed for lambing ewes in the coming autumn.

Supplementary feeding with oats should go a long way towards preventing pregnancy toxaemia. Where lucerne hay is available as well, good milk production as well as prevention of pregnancy toxaemia can be expected.

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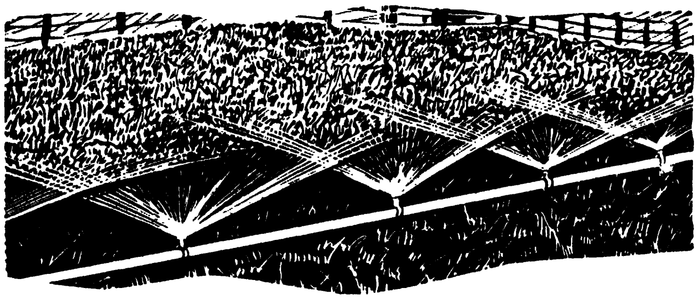

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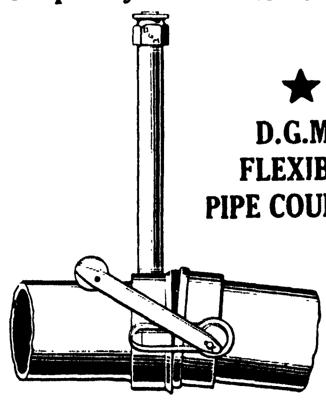

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INSECT PESTS.

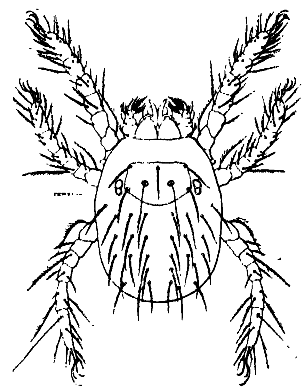
Notes contributed by the Entomological branch.

Grass Itch Mites (*Acomatacarus australiense*).

EVERY year, during the summer months, numbers of reports are received by the Entomological Branch, of persons being bitten by minute red mites while working in their gardens or on grassed areas, and these mites usually prove to be the "grass itch mite."

The grass itch mite which belongs to the family *Trombiculiidae*, known by many popular names such as—"scrub itch" in Queensland, "harvest bugs" in England, "chiggers" in the United States of America, etc. The species responsible for "scrub typhus" is *Trombicula deliensis*, and is not known to occur south of Ingham, Queensland.

The grass itch mite. which belongs to the family *Trombiculiidae*, has been known for years in the Sydney district, where it is mostly confined to clay soils and occurs in patchy distribution, principally throughout the western suburbs.. Attacks are usually limited to the period from September to April.



An Itch Mite.
After Hirst.

These minute, blood-sucking mites, which measure about 1/100th inch in length, are bright red, and when feeding attach themselves to the skin of their host in a similar manner to ticks. They attack wild birds and animals, but have not been recorded from poultry. Domestic cats are often attacked, and on these animals the mites may be found clustered in the ears. Their bites on man cause itching swellings, which may remain inflamed and intensely irritating for some days.

Little is known of the life-history of these mites, but the adults lay their eggs in batches in the soil, and this may account for their irregular distribution over any particular area of ground. It is not unusual for one property to be infested and for a neighbouring one to be only slightly infested or free from infestation.

An officer of the Entomological Branch, while working with the A.I.F., carried out investigations on the "scrub itch" mites, which are the carriers of "scrub typhus" in Northern Australia and the Islands, and it was discovered that attacks from these mites could be prevented by treating clothing with dibutyl phthalate. This was then issued to the troops in infested areas as "anti-mite" fluid.

American investigators found that by dusting the ground with sulphur, excellent control of the mites could be obtained under some conditions.

SUGGESTED CONTROLS.

Details of the adaptation of this knowledge to civilian requirements have not yet been worked out, but the following methods are suggested:—

Sulphur.

The sulphur is dusted over the ground at the rate of 1 lb. per 200 square feet, and is best applied with a dust gun. It may, however, be shaken out of a hessian bag or loosely knitted sock.

The mites, when stimulated by human or other activity, crawl up out of the soil, and those coming into contact with the sulphur are killed. This treatment may be affected by rain following dusting, or by the amount of weed growth, and it may be necessary to make repeated applications.

Dibutyl Phthalate.

This chemical, which is almost colourless and odourless, and harmless to the skin, is remarkably poisonous to the mites. One fluid ounce (two tablespoons) applied to shirt, trousers and socks prevented all biting in New Guinea, until the clothes had been washed with cold or warm water and soap at least seven times.

It is known that the Sydney grass itch mite is more resistant, and it must be assumed that treated clothes would only protect until after three warm water washes or one boiling. Ironing does not affect the treatment.

The simplest method of application may be described as follows:—Pour the fluid in a saucer, then dip the finger tips of one hand in the fluid, rub the hands together and then wipe them on the article. Make each smear light so that 80 to 100 wettings of the hand are obtained from each ounce of fluid.

For socks and underclothes, crumple and rub the articles between the smeared hands. Larger garments are most easily treated by being spread out on a table and wiped over systematically. An even cover of all clothing in contact with the body will protect whether the wearer stands, sits or lies amongst the mites. For normal work in the garden, the treatment of socks only would be enough, since the vast majority of the mites reach the body by crawling over the boots.

Dibutyl phthalate used in this way is harmless to the skin of man. It is not known, however, that it is perfectly safe for children, and for the present it must be used with caution. Irritation would only be anticipated from freshly-treated underwear; garments treated and washed would be harmless to the most delicate skin, but still toxic to mites for some three washes. Therefore, the clothing of adults and socks of children may be treated after washing; children's underclothes should be treated before washing.

Suggestions for Use.

For adults.—Treat gardening clothes weekly or after every third wash, whichever is the more convenient. Six smears to each sock; about fifteen smears each to underpants and singlet; thirty to forty smears each to trousers and shirt. If in doubt as to which clothes have been treated and which have not, apply a few smears to each sock at each change.

For children.—Treat underclothes weekly and wash after treatment and before wearing.

Hand application was adopted in the Army because it eliminated the necessity for extra equipment. To treat a set of clothes takes about ten minutes.

Atomisers must not be used as they give poor impregnation.

A shaker bottle has advantages for home use. It may be made as follows:—Fit a tall, narrow, screw-top bottle with a leather washer and punch about two dozen holes (as fine as they can be made) in the metal top. Pour the dibutyl phthalate in the bottle with four times its bulk of water. The water floats on the phthalate, but the vigorous shaking required to expel the mixture through the fine holes in the cap, when sprinkling the clothes, causes the two fluids to mix in a temporary emulsion and prevents separation in the bottle.

Warning.

Dibutyl phthalate is harmless to wool and cotton. It is a powerful solvent of plastics and may damage some artificial fibres. It will injure such articles as fountain pens, plastic watch glasses and spectacle frames if it comes in contact with them. *Use it on wool and cotton only.*

Although harmless to the skin of hands and face, it is violating irritating to the eyes, nose and mouth. That this need not be important is shown by the fact that the fluid was in general use in New Guinea for a year before injury was observed; a drop in a man's eye caused extreme inflammation but with total recovery in a few days. *Children, however, must not be allowed to handle it.*

The Gladiolus Thrips (*Taeniothrips simplex*).

THIS thrips is a widespread and serious pest of the gladiolus in New South Wales, and if adequate control measures are not undertaken it is not uncommon for the entire crop to be ruined. It also causes great losses in a number of other countries, including the United States of America, Canada, South Africa, Jamaica, Bermuda and the Argentine.

Nature of Injury.

Unlike many other species it is somewhat restricted in its range of food-plants. Although preferring the gladiolus, it may also infest iris, calla or arum lily, torch lily or "red-hot poker" (*Kniphofia* sp.), montbretia (*Tritonia* sp.) tiger flower (*Tigridia pavonia*) and carnations.

This thrips, in both its adult and larval stages, feeds by rasping the surface of the plant tissues and sucking up the sap which exudes. This injury, on the foliage, causes a characteristic silvering, and if the leaf damage is extensive the new corm may be considerably stunted. As soon as the flower spikes appear the thrips make their way within them and cause the blooms to become deformed or even prevent them from opening. This injury is often attributed by growers to other causes such as drought or disease.

It is well-known that there is considerable varietal resistance to attack, but in general, light-coloured varieties are least liable to damage, and deep reds and purples are most severely affected, although there are exceptions to this. Slight injury on dark blooms appears as irregular white or flecked areas and this considerably reduces their market value.

In addition to destroying the foliage and blooms, this thrips will also continue to feed and breed on the corms in storage. The surfaces of the corms become sticky, and later, hard and scabby, thus having their market value greatly lowered. The young root buds may also be injured and their subsequent development affected.

Description and Life History.

The adult females, which measure about one-fifteenth of an inch in length, are dark-brown in colour and possess two pairs of delicate, fringed wings. The males are slightly smaller than the females.

The minute, kidney-shaped eggs are inserted in various parts of the plants, and there are two larval stages, a prepupal and a pupal stage, in all of which the insects are lemon-yellow in colour. The larvae and prepupae are to be found within the leaf-sheaths and flower buds, but the adults feed mainly in the open. The pupal stage may be passed either on the plants or in the soil.

The life-cycle, from egg to adult, may be as short as ten days, but under cool conditions may occupy a month or more. The adults may live for a month or more and a number of generations develop during the year. In the Sydney district, all stages have been observed on volunteer plants, in private gardens, during the winter months.

The Gladiolus Thrips.

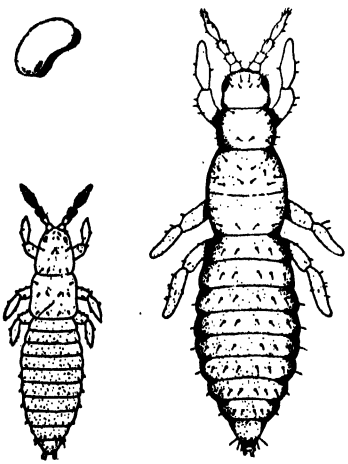
This insect thrives best under hot dry conditions. Cool and wet weather affect them adversely and heavy rain, at times, destroys large numbers.

Control.

As volunteer plants provide a ready source of infestation, these should be pulled up and destroyed some time before the main crop is planted.

Commercial growers whose properties are somewhat isolated from areas in which gladioli or other listed host plants are growing, would be well advised to make a break in planting, so that for a period of several months there is no foliage on which the thrips can feed and develop. Endeavours should be made to select, for new plantings,

ground which is as far removed as possible from old plantings, or from private dwellings, in the grounds of which volunteer plants and uncontrolled thrips infestations commonly occur.



Egg, First-stage Larva and Second-stage Larva.

[After Mackenzie.

The adult thrips do not fly readily, and migration through an area of gladioli, while slow, is greatly assisted by wind. Based on this fact, an overseas recommendation, for areas where there is a dominant prevailing wind, is the planting of the early-blooming varieties in the beds most distant from the direction from which the wind blows.

When water is available, the frequent use of overhead sprinklers, or frequent and thorough hosing of the plants, will retard the development of the thrips. The drainage of the ground should be satisfactory if either of these methods is adopted.

Storage of Corms.

The storage of corms in flaked naphthalene in paper bags or other suitable containers for a period of three weeks is effective, but the treatment should be completed before the corms shoot, as otherwise some injury may result. About 1 oz. of naphthalene should be used with each 100 corms.

Other methods of corm treatment include the use of hot water, storage at a temperature of 50 deg. Fahr., fumigation with calcium cyanide, dipping in corrosive sublimate (mercuric chloride) solution and other mercuric compounds.

Field Control.

Owing to the fact that the larvae feed within the leaf-sheaths, control of field infestations is very difficult, and the application of foliage poison sprays has given the best results.

The spray recommended is:—

Paris green, ½ oz.; brown sugar, 2 lb.; water, 3 gal.

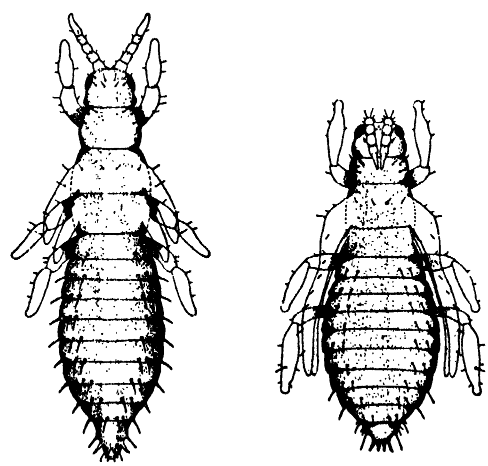
In the United States of America the following spray is frequently used:—

Paris green, ½ oz.; molasses, 1¼ pint; water, 5 gal.

This spray has been found more toxic, but the disadvantage of sprays containing Paris green is their liability to cause foliage burn, particularly when the humidity is high or the plants are not in a thrifty condition. Paris green settles rapidly, and it is particularly important that sprays containing it are thoroughly agitated.

Another spray that is highly toxic to this thrips and has the added advantage that it does not injure the foliage, consists of:—

Tartar emetic (antimony and potassium tartrate), 1 oz.; brown sugar, 4 oz.; water, 10 pints.



Prepupa and Pupa.

[After Mackenzie.

These foliage poison sprays should be applied in the form of a fine mist, and spraying should be commenced as soon as the first injury is noticed and repeated at weekly intervals until the first flowers open. The plants should be closely examined at regular intervals from their early stages of growth onwards.

This farmer has no Soil Erosion

HE says:—"I purchased from your Company some time ago two sets of McCormick-Deering Tractor Disc Harrows and have since used them extensively for "turning in" the stubble. I have found them excellent for this purpose.

"By this method of farming, humus is returned to the soil—improving its fertility—and the straw binds the soil together. I have no soil erosion at all, and even this past season, one of the worst droughts ever experienced, I harvested a ten-bushel crop—a district record—which shows that crop yields can be improved and that soil drift can be controlled in the paddock by using the right equipment."

—(Sgd.) F. J. HOFMAIER, Rosebery, Vic.

McCormick-Deering Tractor Disc Harrows will help to control erosion on your farm. They are regularly supplied with 18-in crimped centre plain discs or can be equipped with 20-inch cut-out discs for more effective cutting up of extra heavy straw stubble. Available in 5, 6, 7, 8, and 10-ft. sizes. Ask your nearest International Harvester Agent for prices and full details. For prompt delivery place your order early.

INTERNATIONAL HARVESTER COMPANY OF AUSTRALIA PTY. LTD. (INC. IN VIC.)
Branches in all Capital Cities

GL-34-24

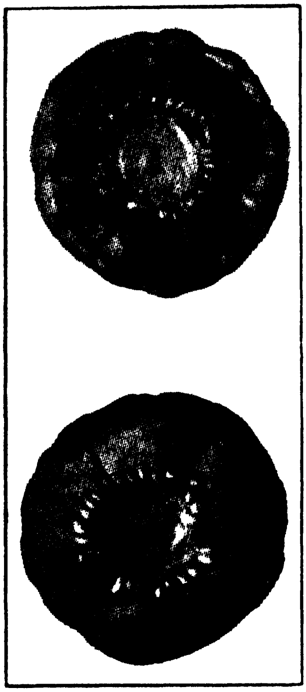
McCORMICK-DEERING
TRACTOR DISC HARROWS

Dusting at weekly intervals with a dust consisting of—

Derris powder, 1 lb.; Kaolin or talc, 8 lb.

has also given good results.

with this chemical, seven weekly applications of the dust were made, as previous work had shown that a 1 per cent. D.D.T. dust on gladioli lost its toxicity to the thrips after one week. No damage to the plants



Thrips Injury on Corm.

Above: Corm showing injured area and killed rootlets around basal plate.
Below: Uninjured Corm.

[*After Weigel.*

Thrips Injury to Foliage and Flower Spikes.

[*After Weigel.*

Recent limited experiments with a 1 per cent. D.D.T. dust and a 0.1 per cent. D.D.T. emulsion spray have given promising results in the control of this thrips. In field work was observed. It is, however, too early yet to make a recommendation for the use of this chemical in preference to those mentioned above.

The Tomato Mite (*Phyllocoptes lycopersici*).

IN the December, (1945) issue of this *Gazette*, paragraph two under *Control*, page 551, should read:—"2. Spraying with a lime-sulphur solution 1 in 100; that is diluted at the rate of 1 pint of concentrated solution to 12½ gallons of water (1 fluid ounce to 2½ quarts)."

COMMUNITY centres consummate the longing of the common people to retain the renewed fellowship experienced during the war years; the response to an innate call to culture; the insistent desire to participate in the creation of a new order of things. Hundreds of communities throughout Australia are planning to set up community centres. One of the most advanced of these community plans will be described in the broadcast for listening groups at 8.40 p.m. on the National Programme on Monday, 25th February.

Seed Wheat and Oats for 1946 Sowing.

List of Growers of Approved Seed.

IT has been decided to publish again this year a list of growers of approved seed wheat and oats who have supplies available for sale. The crops of the growers listed were inspected by officers of the Department and reached a standard of purity and trueness to type up to the approved standard.

Growers listed should notify the Department immediately their available seed of any variety is exhausted.

Wheat.

Bencubbin.—
Carney, C., "Maranoa," Ulamambri.
Ward, H. E., "Gwenvale," Parkes.
Harley, H. J., "Wattle Park," Tullibigeal.
McLaren, G. J., 'Glenmore," Barmedman.
Cullen Bros., Bunglegumbie, via Dubbo.
Donnett, H., "Braemar," Gulargambone.
Idiens, E., "Kangarooby," Gooloogong.

Bordan.—
Dunkley, A. D., "Bon Lea," Brundah, via Grenfell.

Bungulla.—
Heckendorf, H. F., "Noorongong," Forbes.

Eureka.—
Idiens, E., "Kangarooby," Gooloogong.

Ford.—
Hall Bros., "Ellerslie," Wallendbeen.
Howard, G., Kallara, Springdale.
Fitzgerald, K., Box 294, Griffith.
McLaren, G. J., "Glenmore," Barmedman.
Downing, R., "Merton," Dubbo.
Donnett, H., "Braemar," Gulargambone.
Idiens, E., "Kangarooby," Gooloogong.
Robson, C. C., "Norcia," Rivers Road, Canowindra.
McDonald, H. H., "Belmont," Canowindra.

Gular.—
Cullen Bros., Bunglegumbie, via Dubbo.
Byrnes, E., "Glen Ayr," Burdett.

Javelin—
Carr, R. T., "Enfield," West Wyalong.

Koala.—
Heckendorf, H. F., "Noorongong," Forbes.

Rapier.—
Carney, C., "Maranoa," Ulamambri.
Carr, R. T., "Enfield," West Wyalong.
Ward, H. E., "Gwenvale," Parkes.
Idiens, E., "Kangarooby," Gooloogong.

Waratah.—
Bradford, R., "Cooringle," Nubba.
Idiens, E., "Kangarooby," Gooloogong.

Oats.

Algerian.—
Wilson, R. & Sons, "Fairview," Oberon.
Dickson, A. S., "Yurunga," Oberon.
Witten, R. A., "Willowbank," Oberon.
Howard, G., "Kallara," Springdale.
Burns, W., Goongirwarrie, Carcoar.

Belar.—
Hall Bros., 'Ellerslie," Wallendbeen.
Hill, A. H., "Carawatha," New Molyan, via Mendooran.
Witten, R. A., "Willowbank," Oberon.
Uther, L. F., "Myonah," Cowra.
Ward, H. E., "Gwenvale," Parkes.
Cullen Bros., Bunglegumbie, via Dubbo.

Brigalow.—
Wilson, R. & Sons, "Fairview," Oberon.
Gardiner, A. K., Claremont, King's Plain, Blayney.

Fulghum.—
Crick, P., "Mayfair," Gollan.

Kurrajong.—
Ward, H. E., "Gwenvale," Parkes.

How to Make Whitewash.

OBTAIN, if possible, large pieces of fresh lump lime, place them in a very large bucket or other suitable container, and into this pour hot water. Cold water will do, but hot water is better as it hastens the slaking. The lime will start to boil and break up. Keep it covered all the time with about half-an-inch of water. This is important, for if whilst the lime is slaking it is allowed to rise up above the water in a dry powder it will "curdle." Before the lime commences to boil fiercely, add tallow or common fat in the proportion of about 1 lb. to 15 lb. of lump lime. This makes a good binder which will prevent the wash from rubbing off. If desired, a little yellow ochre may also be added, which will give a cream or buff tint according to the quantity used.

When the lime is thoroughly slaked it should be stirred and sufficient water added to make it a little heavier than, say, milk, after which it should be strained and, if desired, may be applied whilst hot.

Wheat, Oats, Barley, etc.
PICKLE WITH 'CERESAN'
BAYER'S DRY SEED DRESSING
TRADE MARK
BAYER

Wheat, Oats, Barley, etc.
PICKLE WITH 'CERESAN'
BAYER'S DRY SEED DRESSING
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PICKLE WITH 'CERESAN'
BAYER'S DRY SEED DRESSING
TRADE MARK
BAYER

RESTRICTED TRAIN SERVICES.

THE Commissioner for Railways, Mr. Hartigan, feels that no explanation is necessary to readers of the *Agricultural Gazette* for the recent serious dis-arrangement of train services, and the necessity of temporarily withholding privileges and concessions which, by time-honoured custom, the community had a right to expect. Included in these were the inadequate travelling facilities provided at Christmas and New Year and, most regretful, the inability to grant reduced fares for large numbers of school children during the mid-Summer vacation.

It is noted with pleasure that although, in rare cases, irritated travellers blamed either the Railway Administration or individual employees for the unavoidably chaotic conditions which developed, it was never suggested by any responsible body that the Railway Authorities could have done anything better.

The Daily Press featured the inconvenience which passengers and would-be passengers suffered, but the fact that the rural communities were equally inconvenienced by the restricted goods and livestock services was not overlooked by the Department. In every case where it was necessary to cut down goods services the most careful consideration was given to the matter, so that essential commodities, and those indispensable to the carrying on of rural businesses, would be available.

In saying that normal train schedules are being restored as soon as circumstances permit, it can only be emphasised again that the Department's coal supplies come from sources over which it has no control.

S. R. NICHOLAS,
Secretary for Railways.

PLANT DISEASES

DISEASES OF GLADIOLUS

THE diseases described below affect the corms and foliage of gladioli. They can be introduced into an area by the use of infected corms and once introduced can remain in the soil for variable lengths of time. Unless a system of crop rotation is adopted diseases accidently introduced will become increasingly bad with each succeeding crop. Crop hygiene plays a large part in the control of gladiolus diseases. The plants should be lifted about six weeks after flowering and allowed to dry out. Diseased corms should then be culled and burned, and the remainder stored in a well-ventilated, cool, dry place. Allowing the plants to remain in the soil too long after flowering, especially if the soil is wet, increases the chances of disease infection.

SCAB.

Scab is a bacterial disease, the causal organism being *Bacterium marginatum*. It is so called because of the scab-like lesions produced on the corms.

The first sign of attack is a pale yellow, water-soaked, circular spot from which gum is exuded, glueing the husk and fragments of soil to the corm. The gum contains masses of bacteria. The spots darken with age and finally take the form of circular, dark brown depressions, shiny with gum and with a prominent, light-coloured, raised rim. They do not as a rule penetrate deeply into the tissues, and the old lesions can be lifted right out exposing undamaged tissue below. The husks also usually show lesions adjacent to those on the corm.

The infection takes place in the soil before the corms are lifted, as the result of attack by bacteria remaining in the soil from a previous crop, or from the parent corm. Lesions are usually on the lower surface of the corm.

B. marginatum can also cause a destructive "neck rot" of the young plant and also spotting of the leaves. Leaf spots are, at first, of pin point size and reddish brown, becoming larger and circular or slightly elongated and with a slightly darker margin. The leaf spotting and neck rot phases of the disease are most serious in wet seasons.

Control Measures.

1. *Corm Disinfection.*—Experiments conducted under plot conditions have demonstrated that very satisfactory control of scab may be obtained from one or other of the following treatments:—

(*a*) CORROSIVE SUBLIMATE TREATMENT. Dissolve 4 ounces of corrosive sublimate (mercuric chloride) in 25 gallons of water, and immerse the corms for 8 hours.

The chemical is dissolved by adding a small quantity of hot water which contains

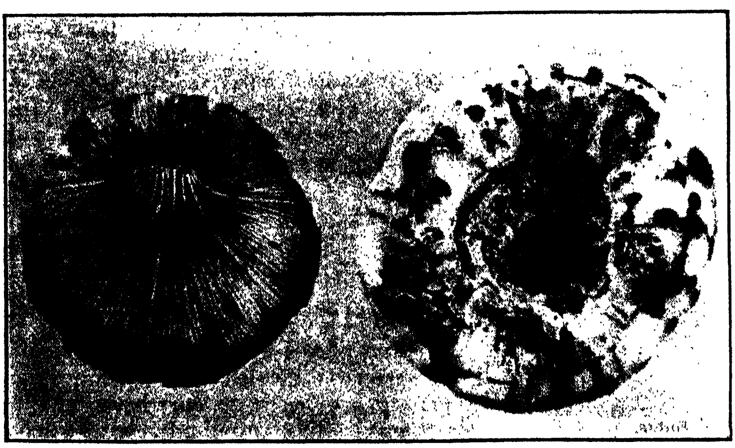


Fig. 1.—Bacterial Scab on Gladiolus Corms.

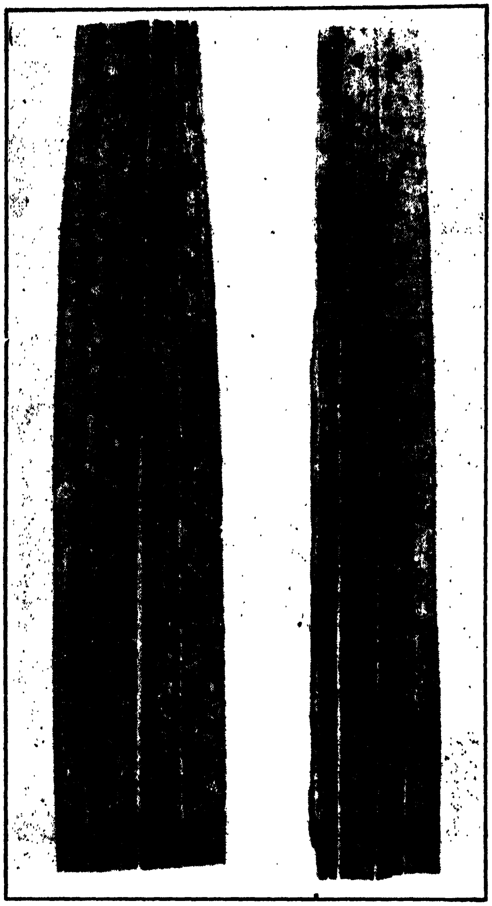


Fig. 2.—Bacterial Scab Spots on Gladiolus Leaves.

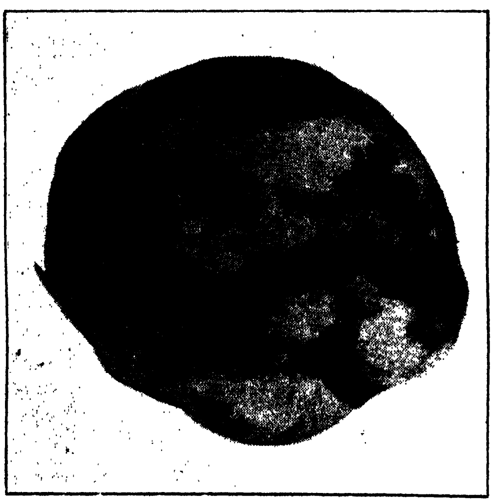


Fig. 3.—Hard Rot of Gladiolus.

about one ounce of common salt in solution. This stock solution is then brought to required volume with cold water. Only glass, earthenware, or wooden vessels should be used for the mixing and dipping, but if metal containers must be employed, they should first be coated on the inside with an asphalt paint. Since concrete reduces the strength of corrosive sublimate solutions, containers made of this material should be avoided. For a similar reason, it is preferable always to use a wooden crate for placing the corms in the solution, rather than to use bags.

The same lot of solution may be used for treatment of about six batches of corms, and, if desired, dipping may be done some time prior to planting.

The effect of the treatment is, sometimes, to retard emergence of the shoots, and this appears to be due to the action of the chemical on the root initials. However, corms, and even sprouted corms, have been dipped for 15 hours and longer, without any adverse effects beyond slightly delaying shoot emergence through the soil.

Owing to its highly poisonous nature, corrosive sublimate should be kept away from children and domestic animals. Coating the hands with fat or vaseline is an insurance against possible skin irritation from this chemical.

(*b*) ACID CORROSIVE SUBLIMATE TREATMENT.

To prepare 25 gallons of dipping solution, 4 ounces of corrosive sublimate are dissolved in a glass or glazed earthenware vessel by stirring in 2 pints of commercial hydrochloric (muriatic) acid. This stock solution is then diluted with water in a wooden barrel or vat so that the final volume is 25 gallons. The time of treatment is 10 minutes. Sprouted corms may be dipped with safety.

The solution may be used for about twelve batches of corms. The necessary precautions outlined under (*a*) should be observed with this treatment also.

(*c*) CALOMEL TREATMENT.

Dipping corms in a suspension of calomel (mercurous chloride) has certain obvious advantages over the corrosive sublimate treatment. The method is expensive,

however, and more suitable for use in treating small lots of corms. The treatment is highly effective.

The suspension is prepared by adding 1 ounce of calomel to every 1½ pints of water to be used.

Corms should be dipped for 5 to 10 minutes, keeping the mixture agitated during the process. Several batches of corms may be treated in the one lot of fungicide, and metal containers may be used with safety. Calomel is not poisonous. As in the case of treatments (*a*) and (*b*), the experiments showed that sprouted corms may be dipped without adversely affecting subsequent growth and bloom production.

The proprietary organic mercurial fungicide Hortosan, D.P. and Arctan are also effective, and should be used according to the makers' direction.

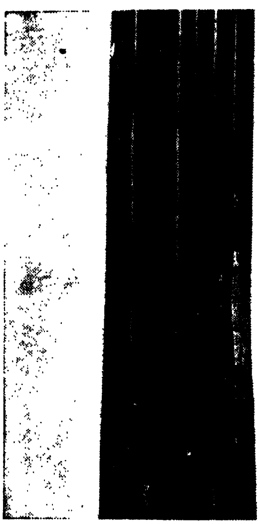


Fig. 4.—Spots caused by Hard Rot Fungus (*Septoria gladioli*) on Gladiolus Leaf.

Following treatment by the above methods, the corms should be dried and stored in a dry, well-ventilated spot until planting time. It is important that the treated material should not be placed in contaminated sacks or crates. Old boxes and crates may be disinfected by dipping them in a formalin solution, 1 in 50, for a few minutes and then drying in the open air.

2. *Rotation of Crops.*—Since the germs of the disease may remain alive in soil for some considerable time, it is important to adopt crop rotations. Gladioli should not be planted on the same land season after season. The beneficial effects of corm treatment may be nullified completely if plantings are made on infested land.

3. *Time of Planting.*—Gladioli are normally planted from July to February under coastal conditions. Where treated material must be planted in land infested with the scab organism, disease development on the new, developing corms will usually be less in plantings made in the warmer months (October-February) than in those set out in winter and early spring.

HARD ROT.

Hard rot is due to a fungous parasite, *Septoria gladioli.* It attacks the growing leaves and also the corms. Lesions on the corms may be distinguished from those caused by scab by their irregular outline, by the absence of the prominent rim and usually by their larger size. Infection takes place in the soil from a previous crop, or from lesions on the parent corm, or from spores washed down from leaf lesions.

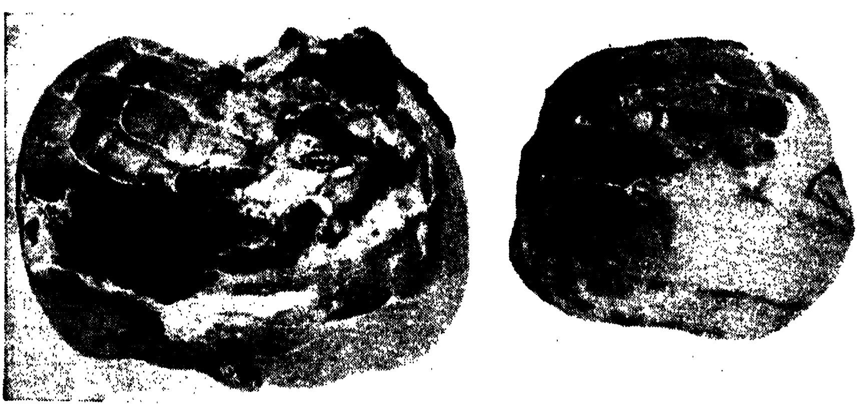


Fig. 5.—Botrytis Core Rot of Gladiolus.
Corm on left shows encrusting black "sclerotia" developed over rotted area.
Corm on right shows discoloration caused by rot.

Sometimes the lesions can be seen at the time of harvesting as depressed, brownish, irregular areas, but newly-infected corms may show little or no evidence of disease. The rot proceeds during storage but does not spread to adjacent corms. The lesions usually extend more deeply into the corm tissue than scab. No signs are usually seen on the husks. The leaf spots produced

Fig. 6.—Botrytis Core Rot of Gladiolus.
Section through rotted corm showing discoloured area extending to the centre.

by this fungus are circular or oblong, brownish with ashy grey centres dotted with small black bodies, the fructification of the fungus. Under moist conditions the spots may enlarge to involve most of the leaf margin.

Control.

Cull and burn affected corms before storing and before planting; avoid infected soil for three years. Dipping the corms is not effective in controlling the disease. Lightly-infected corms planted in new ground will produce a reasonably clean crop if the season is dry. The leaf-spot phase of the disease is controllable by spraying at fortnightly intervals with Bordeaux 1-1-20 + white oil 1 in 100.

BOTRYTIS CORE ROT.

This disease is not important in the Metropolitan Area, but in some of the moister coastal and highland districts it may give trouble, especially to the autumn crops. It is serious in parts of Victoria where it has been extensively studied by officers of the Department of Agriculture.

The symptom of this disease in the corms is the development of a quickly spreading, olive-brown rot, at first firm and then shrinking and becoming dry and corky. Usually the rot proceeds to the core which is rotted. If conditions are moist a black encrusting growth forms on the exterior of the affected parts. This is a resting body or sclerotium.

The fungus (*Botrytis* sp.), which causes the disease is a common mould which grows and produces spores freely on dead flower heads under moist conditions, forming a downy, greyish growth. The leaf symptoms are reddish brown spots, often very numerous, which may remain small or may enlarge to involve most of the leaf area. The flowers too can be infected, light-coloured spots developing on the petals, which wither and become brown.

Control.

Lift the corms as soon as possible, dry thoroughly and store in a dry, well-ventilated place. Dipping as advised for scab will prevent the extension of the disease to other corms during storage. Old flower heads should not be permitted to remain in the bed if the weather is damp. Spraying the foliage as described for hard rot will keep the leaf spot phase of this disease in check.

FUSARIUM ROT.

This disease is caused by soil inhabiting fungi—various species of *Fusarium*— and is most serious in heavy wet soils. Lesions are produced on the corms. At the time of digging they can be seen as large, oval

Fig. 7.—Gladiolus Dry Rot. [*After Moore.*

shrunken areas, often zoned. The rot extends in storage, often reducing the corm to a shrivelled mummy.

Control.

Lift early and discard all affected corms.

DRY ROT.

Dry rot is due to the parasitic fungus *Sclerotinia gladioli*. So far it does not appear to be common or widely distributed in New South Wales.

It affects the leaf bases during the growing period, and the corms. On the corms, numerous small black lesions are produced,

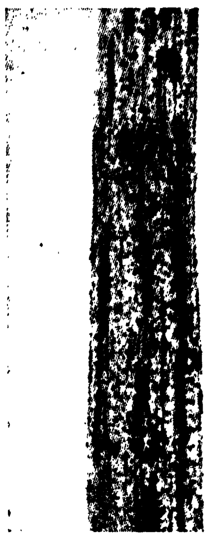


Fig. 8.—Gladiolus Dry Rot.
Part of leaf sheath enlarged to show sclerotia.
[*After Moore.*

from the size of dots to more or less circular spots ¼ inch in diameter. They occur mostly along the lines of juncture of the covering scales. The lesions are, at first, quite shallow, but during storage may extend, involving the whole corm. The covering scales may be affected, showing brittle, dark-coloured areas. The neck rot is usually apparent when the plants are six to eight weeks old. The leaves commence to yellow from the tip, then dry and die and the plant may fall over. An examination will reveal that the neck tissues have been rotted through, the decay spreading inwards from outside. The rotted leaf sheaths are dark brown in colour, with large numbers of small black bodies in the dead tissues. These are the resting bodies or sclerotia of the fungus.

Control.

Cull and burn infected plants and corms. The fungus can survive up to four years in the soil, so crop rotation is necessary.

MOSAIC.

This is a viris disease of gladiolus and is probably spread by aphids. The young leaves of affected plants are mottled with small patches of lighter green. The flowers are usually inferior and the colour may be flecked with darker or lighter patches. Affected plants should be removed and burned.

YELLOWS.

This is said to be one of the most destructive diseases of gladiolus in the United States of America, but it is, so far, not known definitely to occur in New South Wales. It is due to a fungous parasite *Fusarium oxysporum* var. *gladioli*. Large lesions are produced on the corms, with prominent concentric rings. Seriously affected corms will not produce a new plant; and slightly affected corms fail to produce an adequate root system, the plant is stunted

Fig. 9.—Fusarium Rot of Gladiolus.

and fails to flower. A neck rot can also be produced from soil infection.

Losses from Stock Disease.

IF stockowners are fully to appreciate the loss due to stock diseases, they must consider not only that resulting from actual mortality but also that incurred in other ways.

They should consider, for example: (1) The loss of production in milk, eggs, meat, hides, skins and wool; (2) cost of treatment, such as crutching, dipping and drenching; (3) production of inferior quality, such as faulty fleeces, and carcases condemned wholly or in part; (4) failure of stock to develop fully and to produce to capacity; and (5) failure to reproduce, altogether or temporarily.

In "Safeguarding Farm Stock from Disease" (Farmers' Bulletin No. 137), stockowners will find much valuable information on how to curtail losses from this cause. The bulletin is obtainable from the Department of Agriculture, Box 36A, G.P.O., Sydney, price 10d. (including postage).

Approved Seed—February, 1946.

To assist in the production and distribution of approved seed of recommended varieties of crops and vegetables, the Department publishes in this list each month the names and addresses of growers of such seed. For this service a charge of 2s. 6d. is made for each insertion of each variety listed. The number of varieties listed on behalf of each grower will be restricted to twenty-five for the time being. The Department may inspect the crop producing the seed, and in all cases a sample of the seed must be sent to the Department of Agriculture with information as to the location of its production, and must be accompanied by the fee indicated above.

If any seed producer does not wish to pay the advertising charge he may submit his name with the variety of seed and sample to the Department, and if it is approved his name will be listed in the Department and information will be supplied regarding it to inquirers.

Cabbage—

Yates Select Succession, No. 64146—Arthur Yates & Co. Pty. Ltd., 184 Sussex-street, Sydney.

Yates Enkhuizen Glory—A. Yates & Co. Pty. Ltd., 184 Sussex-street, Sydney.

Yates Vanguard—Arthur Yates & Co. Pty. Ltd., 184 Sussex-street, Sydney.

Lettuce—

Imperial 615—Arthur Yates & Co. Pty. Ltd., 184 Sussex-street, Sydney.

Pumpkin—

Queensland Blue—R. C. Morandini, Box 74, Dubbo.

Cauliflower—

Shorts—H. Burton Bradley, Sherwood Farm, Moorland.

Yates Phenomenal Early—Arthur Yates & Co. Pty. Ltd., 184 Sussex-street, Sydney.

Yates Phenomenal Five Months—Arthur Yates & Co. Pty. Ltd., 184 Sussex-street, Sydney.

Yates Phenomenal Main Crop—Arthur Yates & Co. Pty. Ltd., 184 Sussex-street, Sydney.

Hawkesbury Solid White—E. A. Sharp, 110 Gordon-avenue, Hamilton.

Phenomenal Five Months—E. A. Sharp, 110 Gordon-avenue, Hamilton.

Onions—

Extra Early Flat White—A. Yates & Co. Pty. Ltd., 184 Sussex-street, Sydney.

Hunter River Brown—A. Yates & Co. Pty. Ltd., 184 Sussex-street, Sydney.

Hunter River Early White—R. C. Morandini, Box 74, Dubbo.

Hunter River Early Brown—R. C. Morandini, Box 74, Dubbo.

Beet—

Yates Derwent Globe (Improved Crimson Globe)—A. Yates & Co. Pty. Ltd., 184 Sussex-street, Sydney.

Yates Early Wonder—A. Yates & Co. Pty. Ltd., 184 Sussex-street, Sydney.

Swede—

Yates Champion Purple Top—A. Yates & Co. Pty. Ltd., 184 Sussex-street, Sydney.

Varieties of Approved Seed Available.

In order that farmers may be directed to what are regarded by the Department as the most satisfactory local sources of approved seed of recommended commercial varieties of farm crops and vegetables, the Department is willing to supply information concerning such sources of seed of the following varieties:—

Tomatoes—

Rouge de Marmande, Pearson.

Overstocking Has Many Detrimental Effects.

It is a dangerous fallacy to believe that it is necessary to stock a property heavily in order to make it pay. It is a far more profitable proposition for breeders to run fewer sheep that are well bred and fed and well cared for than to depend on large numbers to pull them through.

The wide practice of overstocking is a serious menace to the sheep-raising industry. Associated with it are:—

1. Reduced size of sheep.

2. Reduced weight of wool and returns per head.

3. Increased disease, particularly worm infestation.

4. Increased costs in maintaining the flock from shearing to shearing, particularly during a drought.

If overstocking is persisted in for any length of time it ultimately means reduced carrying capacity due to soil and wind erosion.

Who's afraid of Bees!

Beekeeping Notes.

W. A. GOODACRE, Senior Apiary Instructor.

Hints on the Control of Bees.

THERE are a few rules as to procedure which the young beekeeper should follow closely in order to control the average colony of bees.

First of all, before opening up the hive, the bees at the hive entrance must be given a few puffs of smoke. The guard bees are posted at the entrance and it is necessary that they be temporarily subdued. Then the hive cover should be carefully lifted a few inches and a light smoking applied over the tops of the frames. The cover may now be completely removed and the manipulation of the frames commenced, a little smoke being applied now and again as required to keep the bees down in the hive, particularly those exhibiting a tendency to become excited.

Temperamental Colonies should be Requeened.

A young beekeeper recently wrote to the Department stating that although he was carefully observing these recommendations, much trouble was being experienced, the bees attacking him during any attempt to manipulate the hive. It was evident from the particulars given that the colonies being operated were rather "temperamental" and he was informed that, in order to overcome this difficulty, arrangements should be made to requeen with young Italian queen bees secured from a reliable queen bee-breeder. Nothing is more discouraging to the young beekeeper than to find that he has to deal with temperamental bees. His first impression, usually, is that all bees have this characteristic, which, of course, is far from being the case.

Closer observation will always disclose that there is some difference in temperament and other characteristics between any one colony of bees and others; actually this fact makes for added interest in the apiary work Whilst the average colony can be handled without any thought of it becoming really hostile, any beefarmer may find an odd colony which, through a change in breeding, has developed a temperament which makes the manipulation of this hive a rather uncomfortable business. Such stocks are, or

should be, promptly requeened, not only because of the difficulty of handling this colony, but also to prevent dissemination of the trouble through the apiary.

Factors which Influence Colony Temperament.

Apart from this inherent occasional tendency to become hostile, there are other conditions which at times influence the temperament of bees. For instance, during honey flows from certain species of flora, such as orange trees and, in some cases, ti-trees, bees which are generally of a quiet nature may for the time being become quite temperamental and difficult to control. Then occasionally robbing raids, or certain odours, may cause them to adopt a hostile attitude. A young beekeeper recently found that cotton waste which had been previously dipped in kerosene and used in cleaning work caused trouble. Body odours arising from perspiration may be resented on occasions; also dark, woolly clothing and, in some instances, the type of hat worn may cause some hostility. The experienced beefarmer will certainly guard against offending in this way.

Hostile Bees Are Not the Best Honey Producers.

Occasionally we hear a beekeeper express the opinion that "temperamental" bees are the best honey gatherers. However, this does not work out in general practice. Even if they were, the average beekeeper would prefer to produce a little less honey per hive than put up with the discomfort, and the loss of interest in his work which would surely affect apiary management.

The idea that temperamental bees were the best honey gatherers was responsible, in earlier days, for importations of Cyprian bees. Fortunately, the idea did not prevail and efforts were made to eliminate the breed. However, it is quite possible that some Cyprian blood still exists in odd colonies in some apiaries, and as breeding from the drone side cannot be altogether controlled, some trouble from this source may be expected to arise occasionally in some apiaries.

Pollen Substitutes.

In last month's Beekeeping Hints the subject of using natural pollen as a supplement to soybean flour was discussed. However, it might be added that real substitutes which may become available in the near future and not prove over expensive, have been found to be valuable.

Recent work on pollen substitutes by M. H. Haydak in the United States of America shows that, of a number of pollen substitutes tried out, a mixture of soybean flour,

Pollen Substitute Fed Dry Outside the Hive.

Bees collecting dry pollen substitute offered in a sheltered place in the University of Minnesota Farm Apiary. The food is spread in corrugated paper boxes placed on some sort of support. The boxes may be protected from rain by a slanting roof which will allow the sun to shine on the pollen substitute. The roof may be made from ordinary window glass which should be whitewashed to prevent the bees from flying into it. Often the boxes are placed on canvas or other material to prevent wastage of dry pollen substitute scattered around the boxes by the bees.

Pollen Substitute Candy Fed in the Hive.

In the picture at the left a pollen substitute candy, covered with waxed paper, had just been placed on the top bars of the frames over the cluster of bees.

The picture at the right was taken a week later. Note how the bees have eaten through the pollen substitute in the spaces between the frames. The wax paper now covers only the remaining portions of the candy. The bees have chewed and carried out the paper.

[*After University of Minnesota Extension Folder 130.*

medicinal dried brewers yeast and dried egg yolk proved to be the most efficient in promoting brood raising.

However, when selecting a pollen substitute the efficiency of the substitute is not the only factor to be considered. The physical nature, lack of availability, or cost of an efficient pollen substitute may render its commercial use impracticable.

The following mixtures have been recommended in Extension Folder 130, published by the University of Minnesota as being the best pollen substitutes for commercial use.

Ingredients:—

1. Soybean flour—expeller method fat content 5-7 per cent.

2. Dry skim milk.

3. Dried brewer's yeast—
 (*a*) medicinal yeast (for human consumption);
 (*b*) animal yeast.

Formula 1.

	Parts.
Soybean flour	4
Dry skim milk	1

Formula 2.

Soybean flour	9
Medicinal yeast	1

Formula 3.

Soybean flour	6
Animal yeast	1

The mixtures are fed dry or in paste form. To make the paste mix 1 lb. substitute with 1 quart of sugar syrup made with two parts of sugar to one of water by volume.

The Cool Storage of Peaches and Pears for Canning.

(*continued from page* 83).

in cold storage without delay, they should keep quite satisfactorily for canning for ten weeks at 30 deg. Fahr.

(3) Golden Queen peaches should keep quite satisfactorily for three weeks and Phillips Cling peaches for four weeks.

(4) Peaches picked at the "off-canning" stage will sometimes keep slightly longer than fruit picked at the "canning" stage. The canning yield of "off-canning" fruit after storage will generally be somewhat greater but the quality will not be as good as that of the more mature fruit.

Note.—An interesting point arising out of these investigations is that most of the experimental samples of peaches and pears were canned in a riper state than is usual commercially. This resulted in fruit with more flavour and better colour, but with a softer texture than the usual commercial lines. The pieces of fruit were sometimes slightly ragged and the juice sometimes slightly cloudy. In spite of the poorer appearance of such fruit, tasting tests by two different panels indicated the strong probability of a consumer preference, on the score of superior palatability, for fruit canned riper than usual.

Acknowledgment.

Thanks are due to Messrs. H. Jones & Co. (Sydney) Pty. Ltd. for carrying out the canning of the fruit and for their keen general interest in the investigations.

THE average butter-fat production of New South Wales herds is about 150 lb. (equivalent to about 370 gallons of milk) per head per year, but the potential average—that is, the average which could be obtained by good feeding, is probably about 250 lb. (about 600 gallons of milk per year). That this level is possible is shown by the fact that in the metropolitan areas, where feeding is better than the average, production is about 660 gallons per head.

This level might not be economic in butter-fat areas, but there is not the slightest doubt that heavier and better feeding with higher average production—possibly 220 lb. of butter-fat or 500 gallons of milk per year—would mean greater financial returns to dairymen.

FEEDS and FEEDING NOTES.

Contributed by

The Division of Animal Industry.

Lessons from—

RESEARCH ON THE GRAZING HABITS OF CATTLE.

A RECENT report on research carried out in England on the grazing habits of cattle (D. B. Johnston-Wallace and K. Kennedy, *Journ. of Agricultural Science*, October, 1944) **gives some food for thought concerning pasture management.**

Facts obtained from this research were:—

(1) Cattle on good pasture will consume 120 to 200 lb. pasture per day, equivalent to about 25 to 40 lb. of dry feed per day. It might be noted that 150 lb. of pasture is a pile about 6 feet in diameter and 2½ feet high— and this is "mowed" with a 2½ inch "mower";

(2) Maximum pasture consumption (and therefore high milk production) was obtained with pastures about 6 inches high. The amount of pasture consumed fell off when the height of the pasture was less than 4 to 5 inches or higher than 8 to 10 inches.

(3) In each twenty-four hours, cattle spent only seven to eight hours grazing, and of this, only about five hours actually feeding, the remaining two or three being spent in walking. Most important was the observation that no matter what the state of the pasture, the period of grazing was not greatly affected. The importance of an adequate bulk of pasture is obvious. Further, 60 per cent. of the grazing was done by day, the remaining 40 per cent. by night. The practice of relegating the cattle to a night paddock between evening and morning milkings appears, from this evidence, to be inadvisable.

(4) The figures as to the effect of overgrazing on pasture consumption, are striking: with a dense sward 4 to 5 inches in height and carrying 4,500 lb. pasture per acre, the cattle ate 150 lb. per head; when the bulk of pasture had fallen to 2,200 lb. per acre, cattle only ate 90 lb.; when the pasture provided 1,100 lb. per acre, cattle only ate 45 lb., barely a maintenance level of feed. Where pasture matured to 10 inches high and provided 5,000 lb. of feed per acre, the cattle still ate only 70 lb., emphasising the effect of maturity on consumption.

(5) Daily manure droppings by one cow covered 8 square feet and cattle avoided pasture in the vicinity of droppings. Breaking up dung is necessary for maximum utilisation of the grazing area, apart from the fertility aspect.

(6) Low milk production from poor pastures cannot be overcome by increasing the acreage, as cattle, grazing only for a limited time, still cannot improve their feed intake. Feed consumption and, therefore, production, can only be maintained by providing short, dense pasture. Where such pasture is not available, supplementary feeding with conserved fodder and concentrates, and not increased acreage, is the answer.

(7) Mowing or grazing to within ½-inch of the ground results in greater pasture production than mowing to 2 to 4 inches, and prevents accumulation of dead herbage, which discourages close grazing.

It is emphasised that these observations are the results of research under British conditions, and may not be directly applicable in detail to Australian conditions. However, there is no doubt that the principles are sound.

The conclusion of these workers was that the ideal pasture was one 4 to 5 inches in height, with equal parts of clovers and grasses, and which was grazed to within ½ to 1 inch of the ground. Milking stock should get first preference and then be followed up by other stock to remove the uneaten herbage.

THE NUTRITIONAL REQUIREMENTS OF POULTRY.

Practical Application of Results of Research.

(*Continued from page* 50.)

G. L. McCLYMONT, B.V.Sc., Veterinary Officer.

Methods of Feeding.

A CONNECTION between feed consumption and egg production is obvious; feed consumption rises with the seasonal increase in egg production and decreases as egg production falls off in the autumn. However, many men are under the impression that feed consumption determines egg production, and endeavour by various means to tempt the fowls to eat more feed. They are working on a wrong assumption. Provided the feed is palatable and balanced, inherited capacity and the season will determine the rate of egg production, and the rate of egg production will be reflected in feed consumption. As the rate of egg production increases, the demand for feed, and therefore feed consumption, will increase; as the rate falls and feed requirements fall, consumption will fall.

This point is important. It is evidence that measures designed merely to "stimulate" food consumption with a view to increasing egg production are largely doomed to failure. All the poultry feeder can do by way of promoting high production is to provide sufficient, nutritionally-complete, palatable feed by one of several methods, provide suitable environmental conditions, and, of course, breed for high egg production.

Feeding Systems.

Systems of feeding vary widely in detail. However, one of the following is usually the basis:—

(1) Wet mash and whole grain.
(2) Dry mash and whole grain.
(3) All mash.
(4) Free choice of whole grain and high protein supplement.
(5) Pellet feeding.
(6) Soaked grain feeding.

There are many minor variations, such as feeding the dry mash each day or from self-feeders, feeding the grain in the litter or from self-feeders, feeding both wet and dry mash, and so on.

Which of all these methods is the best? Arguments among poultry farmers on this subject are never-ending, so it might be worthwhile to submit opinions based on extensive experiments, experience and hard facts.

Ewing, in his book, "Handbook of Poultry Nutrition" (1943), reviewing an immense amount of experimental work, concludes that "experiments have not indicated a decided superiority or outstanding weakness of any method. Practical poultry men use all methods and supposedly with equal success."

Pederick of the Victorian Department of Agriculture, commenting on many years' experimental work, states (*Jour. of Department of Agriculture of Victoria*, November, 1944) that "in reviewing the tests since their inception, the most striking feature is that with many different methods that have been tried, and rations that varied considerably in composition and analysis, egg production has been consistently good."

Titus, Officer-in-Charge, Poultry Nutrition Investigations, United States Department of Agriculture, states in his book "Scientific Feeding of Chickens" (1941), (chickens in America covering all ages of fowls), ... "it is much more important to supply the chickens with adequate quantites of all the necessary nutrients than it is to follow a given system" . . . . "any system that ensures, through design or by accident, an adequate supply of all the essential nutrients, is sure to be successful from the standpoint of nutrition."

Adequate Essential Nutrients and Efficient Operation are Necessary.

It is fairly evident, then, that any feeding system, provided it supplies adequate essental nutrients and is operated efficiently, can be expected to give good results. The actual decision as to which system is to be

adopted must be guided by practical considerations, such as labour costs, cost and availability of the different types of feeds, feeding facilities, and so on. For instance, where grain such as wheat, oats, maize, barley or grain sorghum can be grown cheaply an obvious method of feeding would be to provide a mixture of whole grain or even a single whole grain in a self-feeder, and meat meal or a mixture of meat meal with other high protein concentrates in another self-feeder.

Again, where ample cheap bran and pollard is available, a dry or wet mash, or all mash made up largely with mill offals, would be the system of choice.

Some Practical Considerations.

Practical points which might be borne in mind when considering which system of feeding is to be used are:—

(1) In general, crushed grains are dearer than whole grains, so that all mash rations are usually somewhat dearer than mash-grain rations. Against this, however, is the saving in labour through only one feed mixture having to be handled.

(2) Experiments have so far failed to indicate that wet mash has any definite advantage over dry mash, but nevertheless many poultry-farmers prefer wet mash to dry. Wet mash has the disadvantage of requiring regular daily feeding, while dry mash can be fed in a self-feeder, requiring only intermittent attention and then at a time most convenient.

(3) There is no strong evidence that pellet feeding has any advantages over other systems.

(4) There is no strong evidence that soaked grain feeding is superior to dry grain feeding.

(5) Self-feeding systems, provided the self-feeders are properly supervised, appear to be as efficient as daily feeding.

(6) There is no evidence that litter feeding of grain is superior to hopper feeding.

Composition of Rations.

By now it should be fairly apparent that the actual nutrients in a ration, and not the particular feeds or systems of feeding are the most important factors in successful feeding. In other words, as long as the ration and the system of feeding enable the birds to obtain adequate nutrients there is every prospect of successful feeding. There is no "best" method of feeding.

Cost of the different types of feeds should be the main factor in deciding the composition of the ration and not adherence to any particular "standard ration." Of course sudden changes in feed to enable inclusion of the cheapest feed in the ration should be avoided, but gradual changes to enable the ration to conform with feed prices, are warranted. Points which might be kept in mind when formulating rations are:—

(1) Mill offals (bran and pollard) can form practically the whole of the mash on a mash-grain ration. However an all-mash ration of mill offals would probably not be successful.

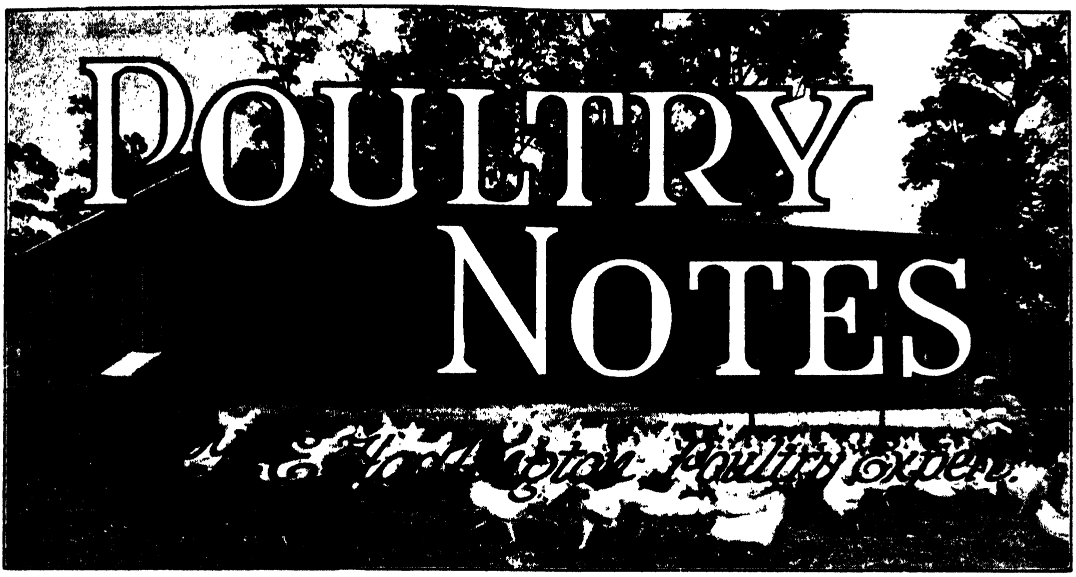
(2) The cereal grains wheat, barley, maize and grain sorghum are of approximately equal food value, and can be readily substituted for each other in mashes and grain mixtures, the choice of grain depending on cost per lb. of grain—not the cost per bushel, as the bushel weights of these grains vary as follows: wheat 60 lb., barley 50 lb., maize 56 lb. and grain sorghum 60 lb.

(3) Oats are too high in fibre to be used as a very high proportion of the ration, but they can form up to 30 per cent. of the total ration. Crushed oats can form up to either half of the mash, or whole oats half of the grain, on a mash-grain ration. Oats are particularly valuable in preventing cannibalism.

(4) Oil meals such as peanut meal, linseed meal and cocoanut meal can provide a substantial part of the protein in a ration, but meatmeal should provide at least a proportion of the protein, especially in rations for breeders.

(5) Any grain by-products, except those high in fibre, such as rice hulls, can form part of a ration. Such materials are rice pollard, hominy, gluten meal, and so on.

(To be continued.)



Housing Layers

THERE is some diversity of opinion as to which type of house is the most suitable for layers, and although various types which are quite satisfactory are seen on poultry farms, there are some which are unsuitable and cause lowered production or poor health of the birds.

There are three main types of houses used for layers, viz.: the semi-intensive, intensive and roosting house. The decision as to which type should be adopted is governed mainly by the circumstances of the case, i.e., whether adequate land is available, the financial position of the farmer and climatic conditions.

The Systems Described.

Under our climatic conditions, the semi-intensive system is ideal, as it enables the birds to be allowed out during the daytime in favourable weather and to be shut in late in the afternoons during the winter and on cold bleak days; they are thus protected from the extremes of temperature which are sometimes experienced in the winter months.

The houses should be sufficiently wide to permit of three or four perches running lengthwise at the back of the house, and the front portion should be used for scratching material, although it is preferable to use scratching litter over the whole of the floor. By having a dividing board about 12 inches high separating the front portion from the back, it is not necessary to renew the litter as frequently in the front half as under the perches.

A minimum width which is advisable for a semi-intensive house is 15 feet with a length of 20 to 30 feet, but it is an advantage to have the houses a foot or so wider if possible. However, a minimum floor space of 2 square feet per bird should be allowed. There is no objection to building double houses with a solid division in the centre, but it is not satisfactory to have a long line of these houses with narrow runs, as the ground in front of the houses soon becomes contaminated and unhealthy for the birds. Moreover, where continuous lines of houses are built, there is more risk of damage by windstorms compared with either single or double houses.

Where double houses only are built, the runs can be extended to any width desired. A suitable size for 150 layers is about 70 feet wide by 130 feet long, which allows 60 square feet of run per bird. The length and width, of course, can be varied to suit the particular site, but the width should not be less than 50 feet.

The accompanying plan (Fig. 1) shows a suitable house for the accommodation of 150

layers. The measurements are 22 feet long, 15 feet wide, 8 feet 6 inches high in the front and 6 feet 6 inches at the back. It will be noted that the nests are built out at the front of the house and are fitted with lids to enable the eggs to be collected from the outside if desired. Also, there is a closing device to prevent the birds roosting in the nest at night.

The following table shows the dimensions of houses for varying numbers of birds:—

No. of Hens.	Length.	Width.	Height at Front.	Height at Back.	No. of Perches.
	Feet.	Feet.	ft. in.	ft. in.	
100	20	14	8 6	6 6	3
150	22	15	8 6	6 6	4
200	30	16	8 6	6 6	4

If it is desired to run flocks of less than 100 hens under the semi-intensive system, it is preferable to build a roosting type of house, making it double the length and allowing one half of the length for scratching litter.

Materials for House.

The accompanying table gives a list of materials required to erect a semi-intensive house 22 feet long, 15 feet wide as shown in Fig. 1. It will be noted that palings are shown for covering the walls, but if desired, corrugated iron can be used without altering the framework, although if covered with iron, an aperture 2 or 3 inches wider should be allowed along the back wall. However, if fibro-cement is substituted, the studs would require to be not more than 18 inches apart.

Management of Semi-intensive Houses.

In order to obtain the maximum results from the semi-intensive method of housing, it is essential to provide adequate scratching litter of a suitable type. There are several materials, such as rice hulls, straw, coarse grass hay, etc., which might be used for the purpose.

The procedure which should be adopted during the winter is to commence about the beginning of June to feed the grain in the scratching compartment at about 3.45 p.m., and shut the birds in the houses where they remain until the sun has developed some warmth in the morning, and as previously mentioned, the birds can be kept in all day on very cold, windy, or rainy days. Thus, it is necessary to make provision for feeding the birds in the houses in the morning where wet mash is used, and this can be done by having portable troughs or fitting a line of 5-inch guttering the full length of the house high enough to prevent the litter being scratched into the feed.

As soon as the warm days of spring commence, there is no necessity to shut the birds in, except perhaps when sudden cold changes occur.

In numerous cases where semi-intensive houses are built, the procedure outlined is not followed, and the houses are merely used for roosting and nesting. Thus, the full advantage of the system is not gained. In fact, there is very little benefit compared with a narrower type of house except that the wider houses are somewhat cooler in summer and warmer in winter.

MATERIALS FOR SEMI-INTENSIVE HOUSE.

Materials.	Total Quantities
	sup. ft.
3" × 2" H.W. 2/15', 4/11' for bottom plates	37
3" × 2" H.W. 8/11' for roosts	44
3" × 2" oregon 2/15', 2/22' for top plates.........	37
3" × 2" oregon 4/9', 2/6', 3/7' for studs	35
4" × 2" oregon 6/18' for rafters	72
3" × 1" oregon 7/23' for roof battens	41
3" × 1" oregon 4/20', 5/15', 2/22' for nest supports, end, back and front rails	50
3" × 2" H.W. 1/7' for roost supports	4
3" × 1" oregon 2/12' for supports to 12" plank and general	6
12" × 1" oregon 1/22' for dividing plank	22
3" × 2" oregon 1/20', 1/12' for nest supports	16
H.W. sawn palings, 88/6' for backs.........	
H.W. sawn palings 160/7' for ends and cut for front,	
3" × 1" oregon 1/11', 1/13' for wire door	6
Baltic weatherboards, 40' super	40
6" × 1" T. & G. Baltic or oregon, 4/7', 1/9' for doors	19
Orb corrugated iron, 26 gauge, 12/9', 12/10' for roof.	
Orb corrugated iron, 26 gauge, 3/9' to be cut into 9" lengths to retain filling	
1¼" galvanised screws, 6 lb. for roofing	
Lead washers, 6 lb. for roofing.........	
½" ball cock, 1 only for water troughs.........	
½" H.P. stop cock, 1 only, for water troughs	
4" quadrant gutters, 24 gauge, 4/6' lengths	
Guttering brackets to suit, 6 only	
3" galvanised downpipe, 24 gauge, 1/8' length	
14" japanned "T" hinges, 2 pairs	
60" × 1" mesh galvanised wire netting, 20', for front of house	
30" × 1" mesh galvanised wire netting, 9' for door and over door	
1¾" × 11 wire nails, 10 lb.	
2½" × 11 wire nails, 2 lb.	
3" × 9 wire nails, 2 lb.	
1" × 16 wire nails, 1 lb.........	
Ashes, 1 ton	
Cement, 7 bags	
1 water trough, 22" × 12" × 8" (deep) made of 22 gauge galvanised iron, wired on edges.........	

NOTE:—This list does not include materials for nests.

Intensive Houses.

Where large areas of land are available, there is nothing to recommend the general adoption of the intensive method of housing layers, but if the area of ground is restricted

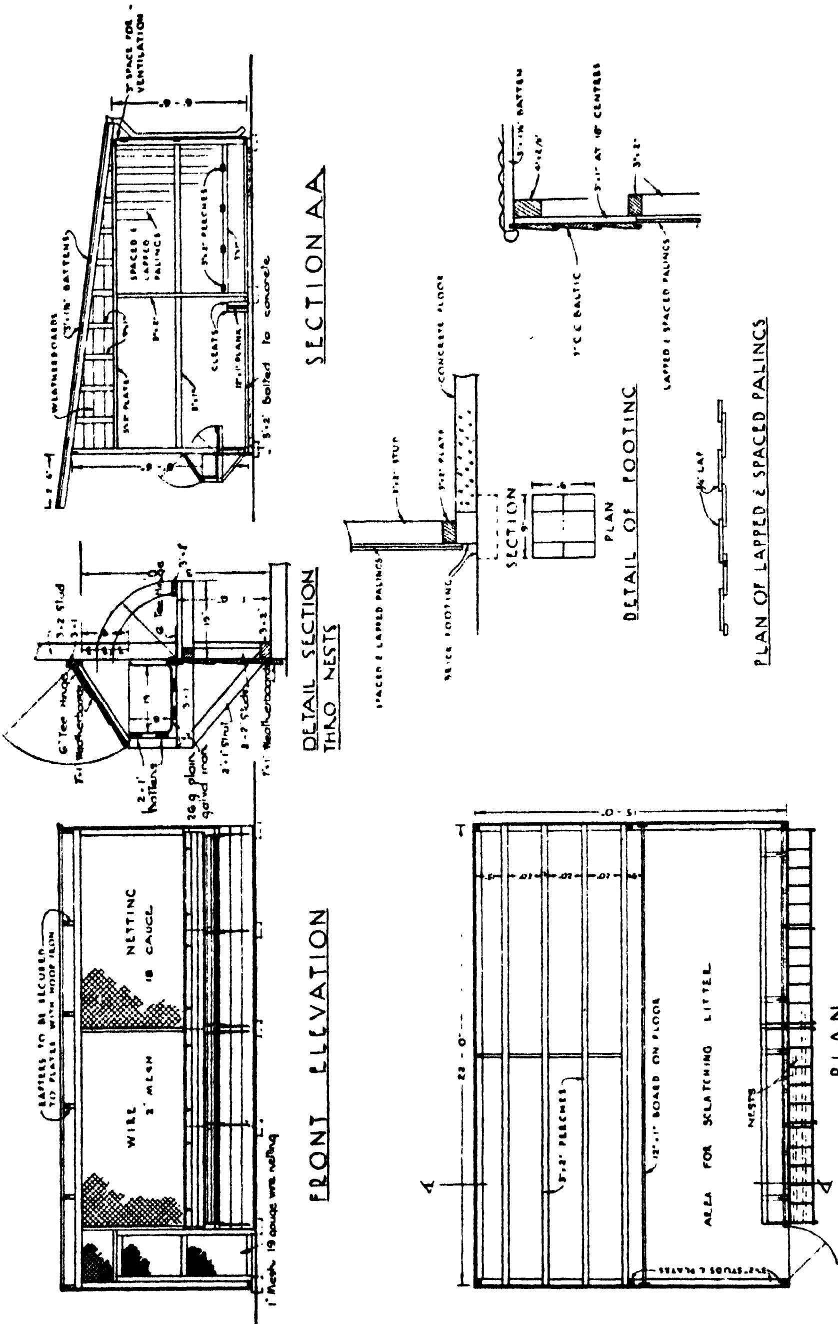


Fig. 1.—Details of Semi-intensive Poultry House.

to the extent that only small runs can be allowed for both young stock and layers, it might be better to adopt the intensive system for the laying stock and give the young stock the benefit of what ground is available. There is little objection, however, to housing the second-year birds intensively if desired. Thus, the laying accommodation for the first-year birds could be semi-intensive and for second-year birds, intensive. Young stock should be given the maximum amount of run possible and should be reared to maturity under these conditions.

Under the intensive system, the birds are kept confined in the houses at all times, and on this account, only half the number of birds can be accommodated in a house of equal size compared with the semi-intensive. A common type of intensive house is of similar construction to the one illustrated (Fig. 1) for a semi-intensive house, but a number of compartments can be built in one line with divisions at each 14 or 15 feet. Each compartment of this size would accommodate fifty birds, allowing 4 square feet of floor space per bird, but it is undesirable to build long lines of these sheds unless they are well supported against windstorms.

In laying down a plan for a farm and making provision for intensive housing, it is advisable to place the intensive houses in such a position that they can be converted into semi-intensive at any time, if desired. This can be done by allowing spaces between the sheds instead of erecting a continuous line.

The main disadvantages of the intensive system are that the birds do not receive as much sunlight as when they have a run, and there is frequently feather picking and cannibalism, especially when the birds are placed in the houses from the time they come on to lay. There is also the extra cost of accommodation to be taken into consideration. On the other hand, less labour is required to attend to birds housed intensively.

Roosting House.

Where it is desired to reduce the initial cost of building a farm, roosting houses could be built and later converted into semi-intensive by adding to the front and thus increasing the width. A suitable type of house for 100 layers is illustrated in Fig. 2: the dimensions of this house are 22 feet long, 8 feet 6 inches wide, 7 feet 6 inches high in the front and 6 feet high at the back. Three perches are provided running the full length of the building and the nests are built on the front in the same way as for the semi-intensive.

As in the case of both the semi-intensive and intensive systems, the houses should face the north or between north and north-east in order to ensure protection from cold winds.

As provision is not made for scratching litter in these houses, it is necessary to have a large run and a suitable size would be 150 feet long by 60 feet wide, which allows 90 square feet per bird. It should be understood, however, that runs of this size will not remain grassed if continually occupied by birds, and while larger runs would be desirable, it is hardly practicable under commercial conditions to allow a greater area.

Common Errors in the Construction of Houses.

As mentioned previously, there are types of houses seen on commercial farms which are unsatisfactory, and some of the main faults observed are outlined below:—

Often, the houses are too wide for the length, which results in poor ventilation. In other instances, the roof is too low, which increases the heat in hot weather and also affects the ventilation. Again, some houses are built too narrow and insufficient scratching area is provided.

Another common fault is not allowing sufficient ventilation at the back of the house. In this connection, at least 4 inches in addition to the space allowed by the rafters should be provided underneath the top plate of the house, but the wider the house, the larger the aperture required, and if necessary part of the space may be cleared up in winter time.

The distance apart of the perches is a very important consideration, and a space of at least 20 inches should be allowed between them, but preferably 24 inches. The perches should also be 20 to 24 inches from the floor.

Attention to these points will result in the improved health of the birds and tend towards better production.

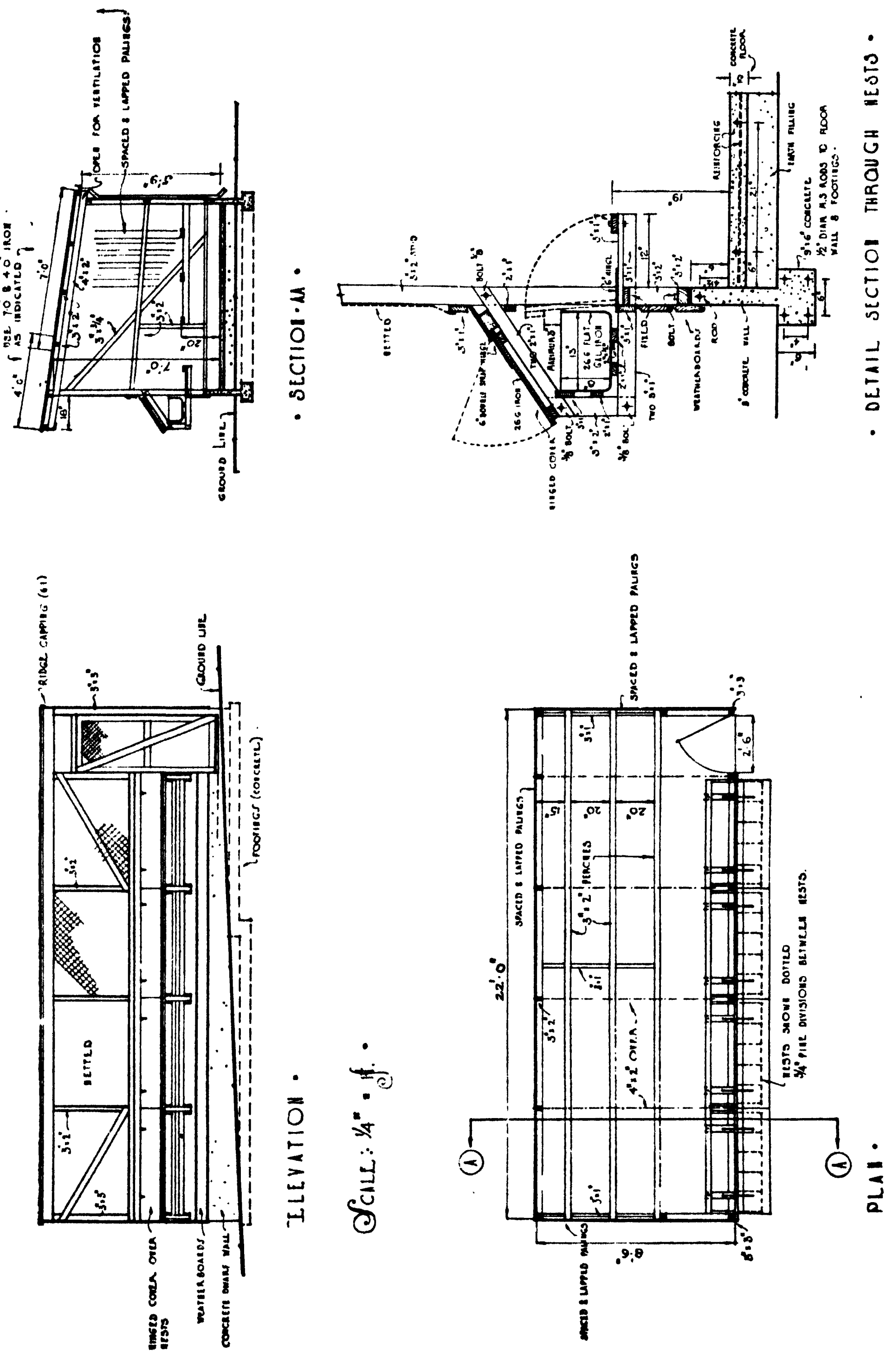
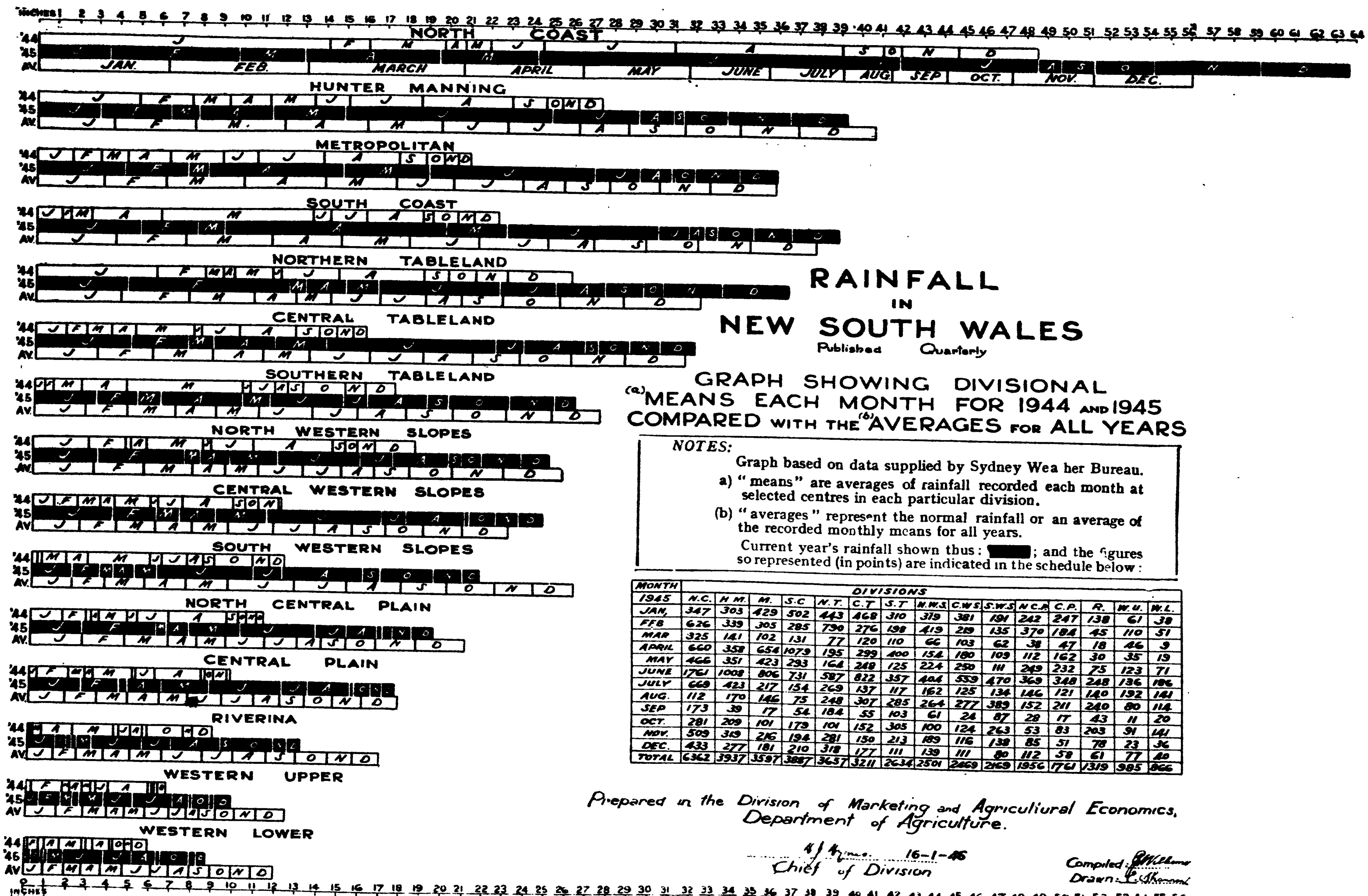


Fig. 2.—Details of Poultry Roosting House.



RAINFALL IN NEW SOUTH WALES

Published Quarterly

GRAPH SHOWING DIVISIONAL (a) MEANS EACH MONTH FOR 1944 AND 1945 COMPARED WITH THE (b) AVERAGES FOR ALL YEARS

NOTES:

Graph based on data supplied by Sydney Wea her Bureau.

a) "means" are averages of rainfall recorded each month at selected centres in each particular division.

(b) "averages" represent the normal rainfall or an average of the recorded monthly means for all years.

Current year's rainfall shown thus: ▬; and the figures so represented (in points) are indicated in the schedule below:

MONTH 1945	N.C.	H.M.	M.	S.C.	N.T.	C.T.	S.T.	N.W.S.	C.W.S.	S.W.S.	N.C.P.	C.P.	R.	W.U.	W.L.
JAN.	347	303	429	502	443	468	310	319	381	191	242	247	138	61	38
FEB.	626	339	305	285	790	276	198	419	219	135	370	184	45	110	51
MAR.	325	141	102	131	77	120	110	66	103	62	38	47	18	46	9
APRIL	660	358	654	1079	195	299	400	154	180	109	112	162	30	35	19
MAY	466	351	423	293	164	248	125	224	250	111	249	232	75	123	71
JUNE	1761	1008	806	731	587	822	357	404	559	470	369	348	248	136	186
JULY	669	423	217	154	269	137	117	162	125	134	146	121	140	192	141
AUG.	112	170	146	75	248	307	285	264	277	389	152	211	240	80	114
SEP.	173	39	17	54	184	55	103	61	24	87	28	17	43	11	20
OCT.	281	209	101	179	101	152	305	100	124	263	53	83	203	91	141
NOV.	509	319	216	194	281	150	213	189	116	138	85	51	78	23	36
DEC.	433	277	181	210	318	177	111	139	111	80	112	58	61	77	40
TOTAL	6362	3937	3597	3887	3657	3211	2634	2501	2469	2169	1956	1761	1319	985	866

Prepared in the Division of Marketing and Agricultural Economics, Department of Agriculture.

[signature] 16-1-46
Chief of Division

Compiled: [signature]
Drawn: [signature]

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AN I.C.I. ANIMAL REMEDY

Tubercle-free Herds.

THE following herds have been declared free of tuberculosis in accordance with the requirements of the scheme of certifying herds tubercle-free, and, unless otherwise declared, this certification remains in force until the date shown in respect of each herd :—

Owner and Address.	Number Tested.	Expiry Date.
Registered Stud Herds.		
Bathurst Experiment Farm (Guernseys)	28	12/10/46.
Berry Training Farm, Berry (A.I.S.)	129	16/10/46.
H. F. Bradley, "Nardoo," Ashford Road, Inverell (Jerseys)	40	13/4/47.
L. W. Campbell, "Dunmallard," Fern Hill Road, Inverell (Jerseys)	39	21/7/47.
E. J. Cattell, "Kapunda," Rob Roy, Inverell (Jerseys)	121	30/6/47.
Christian Bros., Novitiate, Mt. St Joseph, Minto	25	11/9/46.
B. N. Coote, Auburn Vale Road, Inverell (Jerseys)	85	23/7/47.
Cowra Experiment Farm (Ayrshires)	53	9/7/46.
Department of Education, Yanco Agricultural High School (Jerseys)	66	15/2/46.
R. C. Dixon, Elwatan, Castle Hill (Jerseys)	29	5/3/47.
Farm Home for Boys, Mittagong (A.I.S.)	31	24/7/46.
Farrer Memorial Agricultural High School, Nemingha (A.I.S.)	44	28/8/47.
N. L. Forster, Abington, Armidale (Aberdeen-Angus)	164	19/5/46.
Forster and Sons, Abington, Armidale (Jerseys)	86	19/5/46.
A. D. Frater, King's Plain Road, Inverell (Guernseys)	107	11/4/47.
Grafton Experiment Farm (A.I.S. and Aberdeen-Angus)	249	30/7/46.
Hawkesbury Agricultural College, Richmond (Jerseys)	82	19/3/46.
Hurlstone Agricultural High School, Glenfield (Ayrshires)	52	21/7/46.
Kahlua Pastoral Co., "Kahlua," Coolac (Aberdeen-Angus)	257	30/11/47.
E. L. Killen, "Pine Park," Mumbil (Beef Shorthorns)	201	25/9/46.
G. Knight, Tannabah, Coonabarabran	60	30/11/46.
Lidcombe State Hospital and Home (Friesian)	111	3/10/46.
Limond Bros., Morisset (Ayrshires)	62	28/1/46.
McGarvie Smith Animal Husbandry Farm, Liverpool (Jerseys)	72	22/2/47.
W. W. Martin, "Narooma," Urana Road, Wagga (Jerseys)	160	11/7/46.
Navua Stud Farm, Grose Wold, via Richmond (Jerseys)	120	8/10/47.
New England Experiment Farm, Glen Innes (Jerseys)	32	6/3/46.
Peel River Land and Mineral Co., Tamworth (Poll Shorthorns)	110	16/10/46.
C. A. Penney, "Bringa," Dapto (Guernsey and A.I.S.)	97	8/3/46.
W. R. Raper, Calool, Culcairn (Beef Shorthorns)	66	7/3/46.
D. B. Reid, "Evandale," Sutton Forest (Aberdeen-Angus)	61	23/11/47.
Riverina Welfare Farm, Yanco (Jerseys)	130	26/6/46.
F. S. Simpson "Gunnawarra," Gulargambone (Beef Shorthorns)	167	19/11/47.
Trangie Experiment Farm, Trangie (Aberdeen-Angus)	148	15/3/46.
Wagga Experiment Farm (Jerseys)	61	10/2/46.
H. F. White, Bald Blair, Guyra (Aberdeen-Angus)	300	20/4/47
Wollongbar Experiment Farm (Jerseys)	97	1/3/46.
Woomargama Estate, Hume (Beef Shorthorns)	206	7/3/46.
A. Young, "Daylesford," Cudal (Beef Shorthorns)	27	3/1/46.

Owner and Address.	Number Tested.	Expiry Date.
Herds Other than Registered Stud Herds.		
114 A.G.H., Kenmore	70	6/6/46.
Aboriginal Station, Brewarrina	14	20/5/46.
Aboriginal Station, Wallaga Lake	19	29/2/46.
Australian Missionary College, Cooranbong	100	30/8/47.
Barnardo Farm School, Mowbray Park	45	25/5/46.
Brookfield Afforestation Camp, Mannus	203	3/5/46.
N. Cameron, Montrose, Armidale (Late New England Girls' School)	33	20/2/47.
Department of Education, Gosford Farm Home	37	26/2/47.
A. N. De Fraine, Reservoir Hill, Inverell	21	8/6/47.
Ebsman Bros., Inverell	31	22/8/46.
Emu Plains Prison Farm	117	7/11/46.
Fairbridge Farm School, Molong	25	15/4/46.
W. J. Frizelle, Rosenstein Dairy, Inverell	134	16/8/47.
Goulburn District Hospital	5	6/11/46.
W. S. Grant, Braidwood	23	6/2/46.
A. Hannaford, Braidwood	10	7/2/46.
F. C. Harcombe, Hillcrest Farm, Warialda Road, Inverell	53	10/4/47.
F. W. Hunt, Spencers Gully	27	16/2/47.
Koyong School, Moss Vale	2	5/3/46.
J. H. Lott, "Bellevue," Rob Roy, Inverell	41	26/6/47.
Lunacy Department, Callan Park Mental Hospital	34	21/4/46.
Lunacy Department, Gladesville Mental Hospital	20	15/4/46.
Lunacy Department, Morisset Mental Hospital	79	8/3/47.
Lunacy Department, Parramatta Mental Hospital	62	26/7/47.
Lunacy Department, Rydalmere Mental Hospital	57	30/10/46.
J. O. McGufficke, "Lovely Bank," Rob Roy, Inverell	33	25/6/47.
R. G. P. McLane, Ibis Valley, Swanbrook	36	29/5/46.
S. W. Morris, "Dunreath," Swanbrook Rd., Inverell	43	8/6/46.
J. A. Murray, "The Willows," Keiraville	21	8/8/46.
New England University College, Armidale	19	1/5/47.
Orange Mental Hospital	61	21/2/46.
Parker Bros., Hampton Court Dairy, Inverell	125	25/8/47.
Peat and Milson Islands Mental Hospital	25	6/9/46.
G. T. Reid, "Narrengullen," Yass	167	14/7/46.
C. E. D. Richardson, Kayuga Road, Muswellbrook	101	3/7/46.
V. J. Rolfe, "Mount View," Inverell	17	12/2/46.
State Penitentiary, Long Bay	13	30/11/47.
W. J. Stephenson, "Hill View," Fig Tree	53	4/2/46.
St. Ignatius College, Riverview	23	7/2/46.
St. John's College, Armidale	11	20/2/47.
St. Michael's Orphanage, Baulkham Hills	26	1/6/46.
St. Patrick's Orphanage, Armidale	10	15/11/46.
St. Vincent's Boys' Home, Westmead	37	3/7/46.
The Sydney Church of England Grammar School, Moss Vale	48	18/12/47.
J. M. Turnbull, "Pastime," Kayuga Road, Muswellbrook	86	20/3/47.
A. B. Weidman, No. 2 Dairy, Aberdeen Road, Muswellbrook	68	3/9/46
A. B. Weidman, No. 3 Dairy, Kayuga Rd., Muswellbrook	38	6/9/46.
A. B. Weidman, No. 4 Dairy, Kayuga Rd., Muswellbrook	57	2/11/46.
T. J. Wilks, "Oaks Farm," Muswellbrook	27	27/6/46.
A. G. Wilson, "Blytheswood," Exeter	57	6/6/46.
C. Wilton, Bligh Street, Muswellbrook	54	12/5/46.
Youth Welfare Association of Australia	142	19/3/46.

Tubercle-free Areas.

The following Areas have been declared tubercle-free and no cattle are allowed to be kept therein unless subjected to the tuberculin test and found free from tuberculosis :—

Bombala Area.
Inverell Area.
Braidwood Area.
Municipality of Muswellbrook.
Municipality of Queanbeyan.

MAX HENRY, Chief of Division of Animal Industry.

THE AGRICULTURAI GAZETTE

Brucellosis-free Herd Scheme (Swine).

THE following is a list of the names and addresses of owners of herds which have been declared brucellosis-free in accordance with the requirements of the Brucellosis-free Herd Scheme (Swine). The work in connection with this scheme has been undertaken as part of the general campaign against this disease and should perform a valuable service to the industry generally. Owing to the limitations of staff it will not be possible for the Department to undertake the testing of herds in general for this purpose, and in future only herds belonging to Government institutions, registered stud herds, or those containing a preponderance of registered stud animals, will be accepted for inclusion in the list. A charge will be made for the work, since the inclusion of a herd in this list should be of benefit to the owner. After a herd has been accredited, two semi-annual tests will be required, and thereafter annual tests, provided that the conditions outlined in the agreement form are strictly adhered to and that negative results are obtained at each test. So far as the elimination of the disease is concerned, apart from placing the herd on the accredited list, this work will continue as at present.

Registered Stud Herds.

Bathurst Experiment Farm, Bathurst.
Campbell, D., "Hillangrove," Wamberal, via Gosford.
Cowra Experiment Farm, Cowra.
Croft, F., Lugwardine, Kentucky.
Draper, R. E., "Glengar," Capertee.
Farrer Memorial Agricultural High School, Nemingha.
Foley, J. B., Gundurimba Road, Loftville, via Lismore.
Garrison Battalion (2nd), Manly.
Gladesville Mental Hospital.
Government Agricultural Training Farm, Scheyville.
Grafton Experiment Farm, Grafton.
Harris, K. H., Pennant Stud Piggery, Purchase Road, West Pennant Hills.
Hawkesbury Agricultural College, Richmond.
Holland, A. L., Argonne, Tubbul.
Hurlstone Agricultural High School, Glenfield.
Maybin, N. C., Towac, Orange.
New England Experiment Farm, Glen Innes.
Newington State Hospital and Home, Newington.
Ricketts, C. C., "Mangus," Young.
Riverina Welfare Farm, Yanco.
Rydalmere Mental Hospital.
Shirley, G. F., "Camelot," Penrith.
Upston, H. E., Wattle Tree Road, Holgate, via Gosford.
Wagga Experiment Farm, Wagga.
White, A. N., Blakeney Stud, Orange.
Williams, G. R. B., "Gwandalan," Grenfell.
Wollongbar Experiment Farm, Wollongbar.
Yanco Agricultural High School.

Herds Other than Registered Stud Herds.

A G.H. (114 Australia).
Bathurst Gaol, Bathurst.
Brookfield Afforestation Camp, Mannus.
Callan Park Mental Hospital, Callan Park, Rozelle.
Emu Plains Prison Farm.
Glen Innes Prison Camp, Glen Innes.
Gosford Farm Home for Boys, Gosford.
Goulburn Reformatory, Goulburn.
Higgins J. P., "Koranga," Camden.
Lidcombe State Hospital.
Morisset Mental Hospital, Morisset.
Parramatta Gaol, Parramatta.
Parramatta Mental Hospital.
Peat and Milson Islands Mental Hospital Hawkesbury River.

Abortion-free Herds.

THE following herds have been declared free of contagious abortion (Bang's disease) in accordance with the requirements of the scheme of certifying herds abortion-free :—

Owner and Address.	Number in herd.
Registered Stud Herds.	
Bathurst Experiment Farm (Guernseys)	28
Cowra Experiment Farm (Ayrshires)	71
Department of Education—Farm Home for Boys, Mittagong (A.I.S.)...	52
Dixson, R. C., "Elwatan," Castle Hill (Jerseys)... ...	29
Fairbairn & Co., C. P., Woomargama (Beef Shorthorns)	98
Farrer Memorial Agricultural High School, Nemingha (A.I.S.)	44
Forster and Sons, Abington, Armidale (Jerseys) ...	59
Forster, N. L., Abington, Armidale (Aberdeen-Angus) ...	179
Hann, O., Chatsworth Road, St. Marys (Jerseys) ...	14
Hann, O., "Bomerah," Barrington (Jerseys)	42
Hawkesbury Agricultural College, Richmond (Jerseys) ..	96
Hill, E. Pritchard, Bowling Alley Pt. (Jerseys)	96
Hordern, E. D., Cabramatta (A.I.S.)	95
Hurlstone Agricultural High School, Glenfield (Ayrshires)	53
McEachern, H., Tarcutta (Red Poll)	61
McSweeney, W. J., "The Rivers," Canowindra (Beef Shorthorns)	76
Martin Bros., "Narooma," Urana-road, Wagga (Jerseys)	160
Navua Stud Farm, Grose Wold, via Richmond (Jerseys)	120
New England Experiment Farm, Glen Innes (Jerseys) ...	32
Peel River Land & Mineral Co., Tamworth (Poll Shorthorns)	86
Simpson, F. S., "Gunnawarra," Gulargambone (Beef Shorthorns)	150
Training Farm, Berry	118
Trangie Experiment Farm, Trangie (Aberdeen-Angus)	148
Wagga Experiment Farm, Wagga (Jerseys)	25
Walker, Jas. R., "Strathdoon," Wolseley Park (Red Polls)	42
White, F. J., and Sons, Bald Blair, Guyra (Aberdeen-Angus)	263
Whitelaw, L. A.. "Wendouree," Merriwa (Beef Shorthorns)	79
Wollongbar Experiment Farm (Guernseys)	110
Young, A., "Daylesford," Cudal (Polled Beef Shorthorns)	27
Herds Other than Registered Stud Herds.	
A. G. H. (114th Australia)	66
Callan Park Mental Hospital	44
Department of Education—Farm Home for Boys, Gosford	37
Fairbridge Farm School, Molong	89
Morisset Mental Hospital	79
New England University College, Armidale	19
Orange Mental Hospital	61
Parramatta Mental Hospital	30
Peat & Milson Islands Mental Hospital	25
Royal Prince Alfred Hospital, Camperdown : "Yaralla" Herd	94
Rydalmere Mental Hospital, Rydalmere	57
Salway, A. E., Cobargo	87

MAX HENRY, Chief of Division of Animal Industry.

MARCH, 1946.

EDITORIAL—

Better Extension Methods.

TO disseminate knowledge among farmers is the big job of the Department's field officers. To carry out this work efficiently these men and women need to keep pace with modern methods of adult education. Particularly is it desirable that such officers should avoid the all-too-common tendency of the past to hand out ideas and guidance only to farmers anxious to accept them. That has been shown to be insufficient, and is one reason why farm practice to-day lags so far behind agricultural knowledge.

The skilled rural extension worker is not now content to "sell" new ideas to the willing farmer. He aims to improve the methods of the indifferent farmer, the farmer who is sceptical of up-to-date methods, and even the farmer who is antagonistic to the Department's teachings. To perfect agricultural extension officers in the best methods of communicating information to farmers was the aim of the School for Extension Workers, held at the Workers' Education Association Hostel, Newport, from 12th to 21st February.

Forty-five officers, drawn from all the Divisions of the Department attended to receive instruction and take part in exercises designed to improve their ability to make use of all extension agencies—discussions, lectures, demonstrations, writing for press and other printed media, visual aids, radio etc.

The Division of Information and Extension Services of the Department organised the School, and for instructional staff drew upon expert extension officers in all Divisions, and upon commercial firms and outside institutions, such as the Public Relations Section of the Rural Bank, the Sales Branch of the Shell Company, the Australian Broadcasting Commission, the Agricultural Advisory Service of the American Consulate, and the Visual Education Section of Education Department.

Although the real purpose of the School was to improve the ability of the Department's extension workers, thereby ultimately benefiting the farmer, another, and perhaps no less important result, was the re-introduction of returned soldier officers to the Department and to farming problems of to-day.

Many of the extension workers who attended the Newport School had been on

active service for several years. They felt there was a gap in their official lives which tended to undermine their confidence. Mixing with officers from the several Divisions of the Department, and taking part in discussions dealing with farm problems in all phases of agriculture, helped to re-establish their contacts with the Department and gave them a first-hand insight into present-day conditions in the rural industries.

Although this was the third Extension School, only a small proportion of the Department's staff has, so far, been able to attend. Until exery extension worker within the Department has benefited by this course of instruction in extension methods, the Department cannot feel confident that it is meeting the educational needs of the farmers in the most efficient manner. Whilst, primarily, the object of such Schools is to make field and technical officers better "salesmen of agricultural ideas," the ultimate aim is to render better service to farmers.

A Call for Maximum Food Production to Meet the World Shortage.

"No less terrible in its effects upon mankind than war is the aftermath," said the Minister for Agriculture, Hon. E. H. Graham, M.L.A. recently. "The influenza epidemics of 1918-20 took a greater toll of human life than did the four years' conflict which preceded it. To-day we face a situation no less critical, for thousands of people in Europe are actually starving, and the ability of millions to survive the rigours of the next twelve months depends solely upon the extent to which Australia and other great primary producing countries can contribute urgently needed supplies of essential foods."

The Minister said that the State Government was whole-heartedly co-operating with the Commonwealth Government in making available the maximum amount of wheat and flour possible to the world pool established to achieve this great humane purpose. During the forthcoming season, there would be no restrictions as to the acreages which may be sown to wheat, although farmers would still need to apply for licenses, said the Minister, and he desired personally to urge wheatgrowers to grow as much as possible, having regard to sound farming practice. This was required in order that the maximum amount of food could go forward to Britain and other countries where it had been found necessary to impose even more drastic rationing limits than were in force during the war years. The British Minister for Food, Sir Ben Smith, had stated that his Government was dealing with the present situation as a national crisis.

Any assistance within his power, personally, or that of his Department, which would enable the farmers of this State to achieve a record wheat yield in the coming season, would be gladly and promptly extended, said Mr Graham. Although the superphosphate position had improved considerably, shortages would still be felt for some time. Available machinery supplies were being speedily distributed to overcome existing shortages as far as possible. Shortages would still exist but the same spirit of co-operation as farmers developed in the war years to secure the best use of available machinery, would ensure the maximum production of wheat.

"There is urgent need also," concluded Mr Graham, "to increase our production of butter, milk products, eggs and meats in order that maximum shipments may be made to Britain. Field officers of the Department, have been instructed to give every possible assistance to farmers to obtain the maximum production of food."

The "Country Hour" Session from the A.B.C.

Coming Talks.

ITEMS of particular interest in the Australian Broadcasting Commission's "Country Hour" Session within the next few weeks are talks by the following:—

Tuesday, 12th March—"Seasonal Potato Information"—by Mr. A. C. Orman, Senior Agricultural Instructor.

Wednesday, 13th March—"Australian Fruit Tree Nurseries"—by Mr. H. Norman Wicks, Adelaide.

Sunday, 17th March—"An Australian Farmer's Impressions of American Agriculture"—by Mr. Don Shand, Armidale.

Tuesday, 19th March—"Trees and the Man on the Land"—by Mr. R. H. Anderson, Government Botanist.

Wednesday, 20th March—"Wheat Quality"—by Dr. S. L. Macindoe, Senior Research Officer.

Monday, 25th March—"Forests and their Conservation"—by Mr. E. H. F. Swain, N.S.W. Commissioner for Forests.

Wednesday, 27th March—"Commercial Tomato Seed Saving"—by Mr. John Green, Manager, Yanco Experiment Farm.

These talks are given at 12.48 p.m. on Mondays and Wednesdays on the National programme, and on Tuesdays on the State programme. On Sundays the session is broadcast at 9.30 a.m. over Station 2FC.

Some of the Field and Technical Officers of the Department who attended the School for Extension Workers, held at the Workers' Education Association Hostel at Newport.

The School was organised by the Division of Information and Extension Services.

Caterpillar Damage to Sweet Corn.

Problem of Control.

EXTENSIVE damage was caused to sweet corn crops last season by the caterpillars of the maize and tomato moth. It was estimated that at least 10 per cent. of the ears had to be rejected as unsuitable for canning, and an appreciable area was not even harvested because of caterpillar damage.

The prevalence of this pest varies from year to year, and it does not necessarily follow that last year's heavy damage will be repeated this season, but some loss in maize and tomato crops in particular may always be expected, states the Entomological Branch. Many other crops are also attacked.

The control of this pest in maize of any kind has always been regarded as difficult. In the United States, where sweet corn has always been a major product, investigations have been in progress for over fifty years, and practically every method that could be suggested has been tried without achieving any real solution of the problem.

The most recent methods that have been evolved are known as the mineral oil treatment and the clipping of the silks. Opinions differ as to the relative effectiveness of these treatments in protecting the ear, but in a recent bulletin the clipping method is said to be more effective and economical than the mineral oil treatment. Neither of the above methods has been tried here as yet, because sweet corn has been grown in a large way only during the past two years, and last year was the first time serious damage resulted, but details of the methods are given in a leaflet obtainable free on application to the Division of Information and Extension Services, Department of Agriculture, Box 36A, G.P.O., Sydney.

Cattle Tick Found in Upper Fine Flower Qurantine Area.

REFERRING to the recent finding of cattle tick in the area which was previously known as Copmanhurst Tick Quarantine Area, the Minister for Agriculture (Hon. E. H. Graham, M.L.A.) stated, that last June very heavy storms occurred on the Clarence, and unfortunately the fences separating the Casino Quarantine Area from the clean country in the old Copmanhurst Area were badly damaged by trees.

Investigations showed that a certain number of cattle had passed through from the Casino Area, and there was a danger that some of these cattle might have been infested with cattle tick. Action was therefore taken to collect any stray cattle and take them back to Casino, to mend the broken fences and for safety reasons to quarantine that section of the old Copmanhurst Area into which these cattle had strayed. Certain treatments were also carried out and the cattle in this area have been subjected to regular inspection every three weeks.

No cattle tick were discovered until quite recently, said the Minister, but unfortunately it had now been found that this area had become infested at the time referred to.

Agricultural Societies' Shows.

SECRETARIES are invited to forward for insertion in this list dates of their forthcoming shows; these should reach the Editor, Department of Agriculture, Box 36A, G.P.O., Sydney, not later than the 15th of the month previous to issue. Alterations of dates should be notified at once.

1946.

Queanbeyan (D. Vest)	March 1, 2
Moss Vale (A. E. Summers)	March 1, 2
Tumut (T. E. Wilkinson)	March 5, 6
Jingellic (R. Langshaw)	March 6
Cobargo	March 6, 7
Cooma	March 6, 7
Taralga (L. Alders)	March 7, 8
Tumbarumba (Violet O'Shea)	March 12, 13
Bombala	March 13, 14
Delegate	March 20, 21
Yass (H. B. Robertson)	April 4, 5
Gloucester (R. S. Wilson)	April 9, 10
Camden (G. V. Sidman)	April 4, 5, 6
Castle Hill (Patricia McMullen)	April 5, 6
Muswelbrook (T. B. Haydon)	April 11, 12
Urbenville (S. Stoddart)	April 26, 27
Grafton (C. W. Creighton)	May 2, 3, 4
Albury Sheep Show (A. G. Young)	August, 6, 7
Narrandera (T. L. Bull)	September 13, 14
Albury (A. G. Young)	October 8, 9, 10

SOUTH COAST AND SOUTHERN HIGHLAND PRIMARY INDUSTRIES

Discussed at Bega.

An Agricultural Bureau Activity.

FARMERS and graziers of the far South Coast and Monaro were given the opportunity on the 8th and 9th February to participate in a conference at Bega, addressed by eminent authorities on local primary industries—dairying, vegetable production, beekeeping and sheep raising. The conference was organised by the South Coast and Monaro Division of the Agricultural Bureau of New South Wales, and was attended by delegates from branches throughout the area.

In addition to the addresses, visits were arranged to local properties to inspect stock and to discuss the grasshopper problem; a session was devoted to educational films; and a home management and handicraft session was arranged for the womenfolk.

Visitors were welcomed to the district by the Mayor of Bega (Alderman C. Ayres), and the local Red Cross branches provided meals and afternoon tea at the field demonstrations, so that the conference served as an educational activity among the producers of the district, and also brought the work of the Department and of the Agricultural Bureau under the notice of the people of this country town.

Dairying in New Zealand.

The conference was officially opened by the Hon. J. G. Barclay, High Commissioner in Australia for New Zealand, who took the opportunity to tell the delegates something of the dairying industry in New Zealand. Mr. Barclay is particularly well equipped to speak on this subject, having been a dairy farmer in New Zealand for many years and also having occupied the position of Minister for Agriculture in his homeland.

Describing the dairy country in New Zealand, Mr. Barclay said that the average rainfall in the areas devoted to dairying was 50 inches per annum. No area that received less than 40 inches was considered suitable. No portion of the dairy country was more than 100 miles from the sea, and there were many fertile valleys among high mountains.

Hydro-electric Power.

Hydro-electric schemes were common in the dairying districts, being operated by power boards which borrowed money to establish the schemes and reticulate the power throughout their areas. The Government owned all schemes and the boards bought the power and sold it to the farmers. These schemes had been a great success, and had resulted in many benefits to the rural people, enabling the use of electric light, refrigerators, washing machines, wood cutting plants, and power for all purposes.

New Zealand dairy products exported were valued at £28,000,000 per annum, and

Mr. C. R. Wallace, Entomologist, discusses the Control of Grasshoppers with Delegates.

included 100,000 tons of cheese and 20,000 tons of butter. The industry depended on this export trade for its existence.

Co-operative Factories.

The dairy produce factories were almost all co-operatively owned and there were no direct subsidies to producers, although there were some indirect ones in connection with fertilisers, lime, etc. Producers were zoned to particular factories, and although farmers objected at first, it had been found that this was a most economical method and they would not now revert to the old system. The collection of cream was pooled and the rate was uniform to each supplier, irrespective of the distance from the factory.

Pasture improvement and management had greatly increased the output per acre of farm, this work being greatly assisted by the good rainfall and the cooler temperature in New Zealand as compared to Australia. In this work New Zealand farmers had tried to copy Denmark, which they regarded as the leading dairy country in the world.

The Programme at Bega Agricultural Bureau Conference.

"The New Zealand Dairying Industry"—by Hon. J. G. Barclay, High Commissioner for New Zealand.

"Sheep and Wool in U.S.A.—by Mr. L. V. Toyne, American Vice-Consul in Australia.

"Beekeeping on the South Coast"—by Mr. D. L. Morison, Apiary Branch.

"Artificial Insemination in Herd Improvement"—by Mr. W. L. Hindmarsh, Director of Veterinary Research.

"Nutrition in Dairy Herd Improvement"—by Mr. G. L. McClymont, Veterinary Officer.

"Our Wool Industry and the Competition of Artificial Fibres"—by Mr. J. M. Coleman, Senior Sheep and Wool Instructor.

"Vegetable Seed Production"—by Mr. R. J. Flynn, Agricultural Instructor.

"Grasshopper Control"—by Mr. C. R. Wallace, Entomologist.

"Home Management"—by Miss N. Foster, Extension Officer.

Visits to Kameruka and Tanga.

Handicraft Exhibit—by C. W. A. representative.

Educational Films.

Social.

Non-stripping Favoured.

Practically all New Zealand dairy herds of more than thirty cows were milked by machine, said Mr. Barclay. In half of these dairies non-stripping was practised. If this method became universal it would mean a great saving, since by non-stripping one man could milk 60 cows where previously two men were necessary. The advocates of non-stripping were convinced that the method did not dry off the cows and that the quantity and quality of milk were not affected.

Mr. Barclay said that New Zealand had 33,000,000 sheep—mostly crossbreds—and produced many fat lambs. Some 20,000,000 ewes produced 19,000,000 lambs per year, of which 8,000,000 were exported and were valued at from 25s. to 30s. each. Much of the land now producing fat lambs could be used for dairying should it ever become necessary.

Finally, Mr. Barclay said that New Zealand had provided legislation to control the price of land for a period of five years after the war. The farmers did not like this system, but it was considered unfair to returned soldiers that land values should be exploited at the expense of the men who had been fighting for their country. Under the Act it was necessary for local courts to approve of sales.

The Sheep and Wool Industry in U.S.A.

IN his address on the sheep and wool industry in the United States of America, Mr. T. V. Toyne, United States of America Vice-Consul at Sydney and also United States Agricultural Officer in Australia, said that the sheep men of United States of America could not "teach Australians anything about sheep and wool." Mr. Toyne is well qualified to express an opinion, since he was for some years a county agent or instructor in a stock raising area of his own country.

Sheep in U.S.A., he said, were mostly crossbreds and Down breeds. Only in the western half of the country were stock men interested in wool, and there the sheep run were mostly crossbreds. In other sections

of the country sheep raising was a minor industry and farmers ran only a few hundred or so of Down breeds.

With modern methods of transport, sheep men no longer ran wethers, but concentrated on selling crossbred lambs to lamb raisers who used Down breed rams. The pure breeds were only kept to maintain crossbred flocks. In some cases lambs were raised to 80 lb. live weight and fat, off their mothers, and in other cases were sold to men who specialised in fattening lambs by the use of corn, barley and lucerne. These men fed the lambs to 90 lb. live weight, the weight gain per day being about 1/3 lb. Mr. Toyne said the Corriedale breed had been imported to U.S.A. from Australia and was well liked.

Some of the Cattle seen during the Delegates' Visit to Kameruka Estate.

Woollen mills in U.S.A. usually used from 50 to 60 per cent. of foreign wool. U.S.A. wool was marketed by a different system to Australian, being classed according to the percentage of Merino blood in the sheep and the district in which it was produced. The type of Merino in use was the Rambouillet.

Beekeeping as a South Coast Industry.

THE beekeeping industry on the South Coast and Southern Highlands afforded an example of those instances in which beekeepers were being forced back into areas not so suitable for other agricultural purposes. Mr. D. Morison of the Apiary Branch of the Department of Agriculture told the delegates at the Bega Agricultural Bureau Conference.

Many colonies had been introduced into the district in recent years, he said, migratory beekeeping having been stimulated by the present high price for honey. The South Coast and Southern Highlands, however, was one of the worst in the State for American Foul Brood and this risk had to be considered by beekeepers coming into the district.

The bee was a "community" insect, said Mr. Morison. Individually it had no commercial value, but the fact that they could be kept in large numbers of colonies, gave bees a commercial value. The bee was also unusual in that it was not confined within the fences of the owner and the persons whose properties it ranged across suffered no disadvantage, but rather the reverse.

"Protected" Apiaries.

However, with the increase of the number of beekeepers in the district there was competition for the honey flow. The Apiaries Act had been amended in 1944 to provide for "protected" apiaries. No person could now take bees into a protected area without a permit. This Act also gave protection to permanent apiarists from migratory beekeepers. The first protected area had been established at Nowra where the prospect of the flora had tempted migratory apiarists.

The Flora and Honey Quality.

The flora on the South Coast varied considerably, but the main species of value to

the beekeepers was the Spotted Gum. With a winter flow, as in 1944, it had yielded 100,000 60 lb. tins. In 1945, however, there was no yield and there were no bud prospects for 1946. On the Southern Highlands the main species was the Snow Gum.

Honey as a food was a valuable source of carbohydrate, containing the two sugars, dextrose and levulose, said Mr. Morison. Quality in honey was usually judged by its colour, flavour and density and generally the light, mild, dense honey was preferred. However, local demands exist for other types. The main factor influencing honey quality was the species of flora from which it was obtained. Spotted Gum flows varied in quality, sometimes being first-class and sometimes second-class. The coastal Woolly Butt also produced a high-class honey.

Many colonies had been introduced into the South Coast and Southern Highlands districts during the past few years, and the industry could be said to be growing. Whether it would continue to do so depended upon the maintenance of the Eucalypt flora and the continuance of the good price. At present the overseas demand could not be met.

The Artificial Insemination Service at Glenfield.

THE greatest value of artificial insemination of cattle was the making available of the services of bulls of known high production strain to the small dairy farmer—bulls which these men could not purchase for use on their own farms, said Mr. W. L. Hindmarsh, M.R.C.V.S., Director of Veterinary Research of the Department of Agriculture. It was essential, however, that the bulls used be suitable—that they had been progeny tested and that their offspring produced more butter-fat than the calves' mothers.

The progeny of a bull could not be judged until he reached say, five of six years of age, and if he then proved to be good, he should be used extensively.

About 600 cows were now in the Glenfield "Ring," said Mr. Hindmarsh. The method in use was that the farmer rang the Station before 9 a.m. when a cow to be inseminated was in season. The semen was then collected at the Station and an officer visited the farm, inspected the cow and carried out the artificial insemination. This examination service had been found to be of great value.

The cost of this service was being investigated at Glenfield. Research in U.S.A. had shown it to be about £2 per service, but here herds were smaller. Mr. Hindmarsh said he was inclined to think that the cost would work out from 25s. to 30s. and it was a debatable point whether farmers would pay this figure.

Wool, and the Competition of Synthetic Fibres.

THE world had a surplus of some four thousand million pounds of low-grade wool as a legacy from the war years, said Mr. J. M. Coleman, Senior Sheep and Wool Instructor, addressing the Agricultural Bureau Conference at Bega. The action of the British Government in convening the conference of April of last year, which set up the Joint Organisation (J.O.), was to be commended. The function of J.O. was to "feed in" the 3,000 million pounds owned by the United Kingdom during the marketing of current clips and to maintain the price without violent fluctuations. It was estimated that this would take thirteen years, during which time Australia was to have an export of nine hundred million pounds of wool per annum.

(Continued on page 129.)

The Field Demonstrations.

The second day of the Bega Conference was devoted to field demonstrations.

In the morning the delegates were taken to the Kameruka Estate, where they were shown improved pastures, stud Jersey cattle, and a cheese factory, and discussed with Mr. C. R. Wallace, Entomologist, the control of grasshoppers which have been serious in the district this season.

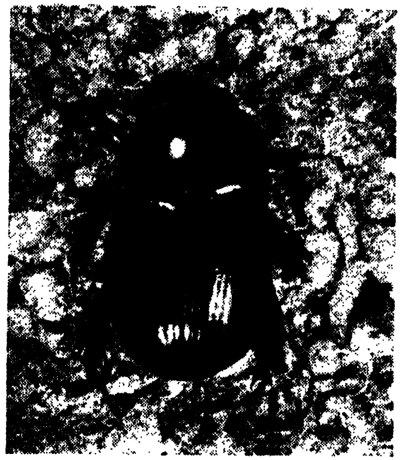
In the afternoon a visit was paid to the property of Mr. T. J. Kelly (the District President) at Tanja, where improved pastures, and crops of maize, sorghum, artichokes, and vegetables were inspected.

THE BLACK BEETLE PEST.

As it Affects—

Coastal Dairy Farmers.

C. R. WALLACE, B.Sc.Agr., Entomologist.



The Black Beetle.

IN coastal New South Wales the black scarab beetle *Heteronychus sanctæ-helenæ* is well known for its damage to vegetable crops, lawns, florists' crops and certain fruits. The pest is even more serious on dairy farms, where it destroys large areas of crop and damages pasture. It so happens that the two plants most grown for dairy cattle are also two of the favourite food plants of the beetle. Maize and *Paspalum dilatatum* are the plants in question.

In the *Agricultural Gazette* for August, 1945, were detailed various control measures which can be adopted where the value of produce per acre is very high, as in market gardens. In dairying, however, the value of produce per acre is relatively low, so that certain measures of value to market gardeners cannot be economically applied to the forage crops and pastures which make up a dairy farm.

However, the dairy farmer has at his disposal several methods of avoiding or reducing the damage inflicted by black beetle, and it is the chief purpose of this article to explore those methods.

Since 1930 this South African insect has spread until it occurs in almost every farming district along the coast from Byron Bay south to Moruya. Although it can infest areas as far inland as Windsor and St. Albans it is most numerous within about 15 miles of the sea, especially in the wide valleys of the coastal rivers.

Residents of many districts are familiar with three spectacular aspects of this species, (*a*) its habit of flying in great massed swarms on warm nights; (*b*) its habit of clustering in thousands beneath mercury-vapour street lights; and (*c*) the acres of densely-packed beetles floating at the edge of flood waters—concentrated by the prevailing wind. The extreme abundance of the beetles is not surprising when it is considered that one square yard of grassland can develop more than 30 beetles, the equivalent of about 150,000 beetles per acre.

Life History and Habits.

The universally familiar stage of the pest is the adult—a glossy, black, soil-dwelling beetle about ½ inch in length. There is a widespread mistaken belief that these beetles grow from smaller beetles. However, the beetle is merely the last of four distinct and unlike stages which differ from each other as greatly as a moth differs from its own caterpillar.

The beetle's four stages in order of development are: (i) egg; (ii) larva (a white curl grub); (iii) pupa* and (iv) the adult (a beetle). Of the immature stages (i), (ii) and (iii), the curl grub is the most conspicuous (see illustration). When fully-fed these grubs are about 1 inch in length. The head is light-brown, but the body is creamy-white or greyish-white, except for the hind segments, which appear black where

* This stage corresponds to the chrysalis stage of moths and butterflies.

the contents of the hind-gut show through the skin. In December and January especially, these active grubs are to be found in the top-soil of pasture land and sometimes in the soil under summer grass in weedy cultivation land.

There is one generation per year; the period of development from egg to adult is short (about 3 to 4 months) but the duration of adult life is long (about 10 months. The following sequence is fairly typical of the pest's behaviour in most districts and in most years:—

The old generation lays its eggs in spring and early summer. These eggs pass through the larval and pupal stages and finally the new generation of adults emerges through late January, February and March. The feeding activities of these beetles cause a wave of crop damage which is often severe up till mid-April. Damage then declines until mid-May, when it ceases altogether. By this time the beetles have become sluggish, and this dormancy persists through the winter. About the first week in September the beetles regain their activity and a second wave of crop damage occurs during the late spring and early summer. Thereafter a decline in numbers sets in; during November and December dead beetles are increaseingly evident on the surface of the ground. By mid-December, in some districts, the dying off is complete and no live beetles can be found until the new generation begins to emerge in late January.

It must be emphasised that the above account is generalised, and that variation occurs in the severity and timing of outbreaks from year to year and from district to district.

A disastrous feature of this species is its great abundance in years of summer drought, when pastures and forage crops are at their lowest ebb of production. The earlier stages of the insect (the eggs and larvae) occur in summer and are adversely affected by wet soil. Therefore, years of low rainfall between September and March favour the increase of the pest. No amount of winter rainfall or flooding will undo this effect of a dry summer, because the only over-wintering stage is the adult, and it is virtually impossible to drown this stage.

The chief breeding grounds of the pest are grassland pastures and old cultivation land which has reverted to weeds (particularly those of the grass family). To a lesser extent the beetles will breed on land under crop which is infested with summer grass or paspalum. The pest appears not to breed in forested land or in intensively farmed market gardens. Typically the pest is less abundant in hilly country; the severest plague infestations appear to be confined to wide tracts of treeless grassland subject to floods. Examples of such country are found between Kempsey and the sea, and also between Berry and the Shoalhaven River.

Feeding Habits of the Beetle on Typical Dairy Farms.

Of the various forage crops, pasture plants and weeds which make up the soil cover on coastal dairy farms, the beetle confines its feeding almost entirely to members of the grass family. All weeds other than grasses, and all legumes (members of the pea, bean and clover family) are virtually exempt from attack. Exceptions to this rule are so rare and trifling that they are without practical importance in dairying.

(1) *Maize* appears to be favoured by the pest above all other plants grown for dairy stock. The beetles sometimes destroy the seed grains in the soil, but more commonly they attack young plants up to 6 inches high. By eating into the plant below ground level the beetles cause it to wilt, collapse and die. Where beetles are plentiful, many farmers are forced to sow the same maize paddock up to five times in a season in order to obtain a crop.

Plants which attain a height of about a foot will usually outgrow light or moderate infestations of the pest, but even mature plants are liable to be felled in heavy infestations. The beetles then congregate below the stems and cobs which are in contact with the soil; up to sixty beetles have been counted eating the grain on one fallen stalk.

(2) *Sorghums* (e.g., *Saccaline*).—Black beetle will, on occasions, attack sorghum, but such cases are infrequent by comparison with the experience in maize. The young plants, in particular, appear very unpalatable to the beetle. Crops nearing maturity seem less unpalatable and the beetles may

cause the stalks to topple over about harvest time. If the stalks are gathered up promptly and removed from the paddock most of the crop can be saved.

(3) *Japanese Millet.*—While this fodder crop is not immune from black beetle, it is general experience that the millet will escape the pest when maize crops all around are being destroyed.

(4) *Cow Cane.*—The types of sugar cane known as "cow cane" on the North Coast are susceptible to beetle damage.

(5) *Wheat and Oats.*—In most beetle-infested districts farmers have never heard of beetle damage to these crops, although they are widely grown for hay. In the worst beetle areas a number of crops are lost each year, but for the most part these winter crops can be safely grown, especially if sowing is delayed as far into the autumn as the climate permits.

(6) *Grasses.*—The beetles exercise a useful function in attacking weeds such as summer grass and barnyard grass. However, they feed heavily upon the horizontal stems of paspalum (*P. dilatatum*), carpet grass, and couch, thus reducing the carrying capacity of pasture.

Paspalum is the grass most affected. When heavy beetle infestations are aggravated by drought and overstocking, paspalum may disappear from grazing land. Occassionally its elimination permits a natural regeneration of rye grass, which forms a pasture greatly superior to the sod-bound turf it replaces. More often, however, the paspalum is succeeded by bare earth carrying a sparse mixture of flatweed, lamb's tongue, clover and a wide variety of dicotyledonous (broad-leaved) weeds.

However there are two grasses—*Phalaris tuberosa* and Kikuyu—which are capable of withstanding very heavy beetle infestation. Beetles can feed fairly heavily upon *Phalaris* and Kikuyu without killing the grass, even where stocking is fairly heavy.

Young ryegrass plants in newly-sown pastures are comparable with wheat or oats in their general susceptibility to black beetle. Old established plants of ryegrass appear to suffer less damage than most other grass species, for good stands of ryegrass are to be seen on many properties in years when paspalum has suffered heavily from beetle attack.

Non-Gramineous Plants.

All the crop and pasture plants considered above are members of the *Gramineae* (the Grass family). The remaining plants commonly found on dairy farms are the broad-leaved weeds, pumpkins and many species of the great legume family.

(*a*) *Weeds* (other than grasses).—Though beetles are often to be found sheltering under flat weeds towards the end of winter, none of the broad-leaved weeds are known to be eaten by beetles.

A Typical White Curl Grub.

(*b*) *Pumpkins.*—In most districts subject to black beetle this crop can be grown with impunity, but in plague infestations the fruits are damaged by the beetles boring into the rind where it is in contact with the soil.

(*c*) *Legumes.*—The beetles' avoidance of legumes has been demonstrated on numerous occasions when heavy infestation of beetle have attacked mixed crops of legumes and non-legumes. The three cases listed below are typical of what occurs:—

(i) Poona cowpeas sown in the same drill as maize remained uninjured though the maize was destroyed by the beetle; (ii) in a mixed crop of oats and field peas the oats were killed out, giving a solid crop of field peas; (iii) clovers alone survived when a mixture of grasses and clovers was sown with barley as a cover crop.

Instances such as these could be quoted indefinitely, indicating that lucerne, cowpeas, clovers, peas and beans can be grown with success under conditions of beetle infestation that would ruin crops of the susceptible

plants listed above. The beetles' distaste for the legumes is very fortunate because this family of plants is outstandingly useful both in milk production and in soil enrichment.

Control Measures.

Direct insecticidal control of the pest by means of benzene hexachloride and D.D.T. is still in the experimental stages. Until the insecticidal methods now showing promise can be proved both economical and practicable on a field scale, farmers are advised to combat the pest by a simple modification of farm practice.

These modified methods will secure forage crops and pastures of high value in the face of severe black beetle infestation. They can be grouped under five headings:—

(1) *Choice of Grasses.*—On properties where paspalum suffers heavily from beetle attack, *Phalaris* and ryegrass should be used as far as possible. On hilltops and in other situations where soil cover is hard to establish, the value of Kikuyu grass should not be ignored.

(2) *Incorporation of Clovers in Pasture.*—(*a*) No new pastures should be sown down to grass alone; suitable clovers or grazing lucerne should be incorporated in all seed mixtures. (*b*) Old grass paddocks should be treated and managed in such a way that clovers are established amongst the grass and maintained as a standby in the event of beetles destroying the grass.

(3) *Choice of Summer Crops.*—Any coastal dairy farmer who intends to break up and plant a piece of "lea ground" (land under grass or weeds), should carry out a thorough sampling of the area. If the sampling shows that black beetles or their larvae are at all abundant in the soil neither maize nor cow cane should be planted. Instead sorghum or Japanese millet should be planted if a bulky fodder crop is required.

On any property where black beetles occur in pest numbers cowpeas should be sown with every crop of maize, sorghum, etc., to provide a reserve of milk-producing feed in the event of beetle taking the non-leguminous part of the crop.

Where summer grazing is insufficient by reason of drought or beetles, a succession of plantings of cowpeas will provide a safe supply of green feed during the warmer months.

(4) *Increased Production of Winter Crops.*—Good crops of oats and wheat are usually secured in many districts where beetles cause heavy losses in the summer crops grown for silage. In these districts it is sound practice to increase the area under winter crops from which hay can be made. Alternatively, oats can be made into excellent silage.

In those districts where autumn-sown cereals are attacked by black beetle all sowings of cereals should incorporate field peas or vetches which will provide feed despite the beetle.

Where cash crops are needed, a dual-purpose crop of green peas can be grown. After two pickings of peas have been made for market the vines can be used as fodder for milking stock.

(5) *Establishment of Lucerne.*—On farms subject to black beetle, a few acres of lucerne are of the utmost value, as this crop appears to have immunity from beetle attack. Lucerne makes hay of high milking value which can be used instead of maize silage.

Application of the farm practices listed above will vary in detail according to local conditions. Liming, top-dressing, choice of varieties and other aspects of crop and pasture management should be discussed with the local Agricultural Instructor.

Influence of Farming Operations.

Most crop loss from black beetle results from the practice of breaking up infested pasture land in autumn, fallowing it over winter and planting it in spring. No amount of cultivation during late autumn, winter and early spring appears to reduce the pest appreciably. Therefore, when susceptible crops are planted in spring, the old generation of beetles is still present in the soil and crop damage inevitably follows.

Where a crop paddock is found to be heavily infested with beetles at the end of winter, the sowing of any susceptible crops should be delayed until the old generation of beetles has become virtually extinct. This point is reached when the numbers of dead beetles to be seen at the surface has reached a maximum and the number of live beetles found in the soil has become very small. This "extinction point" of the old generation is usually reached sometime between

(Continued on page 144.)

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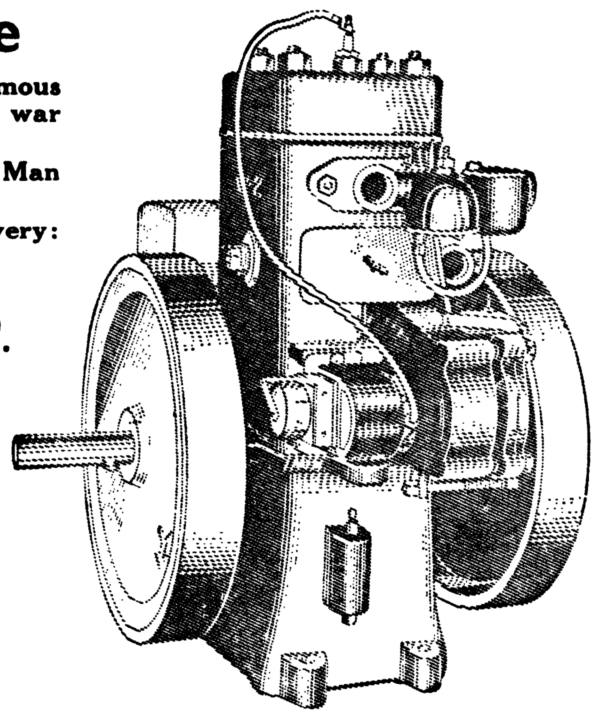

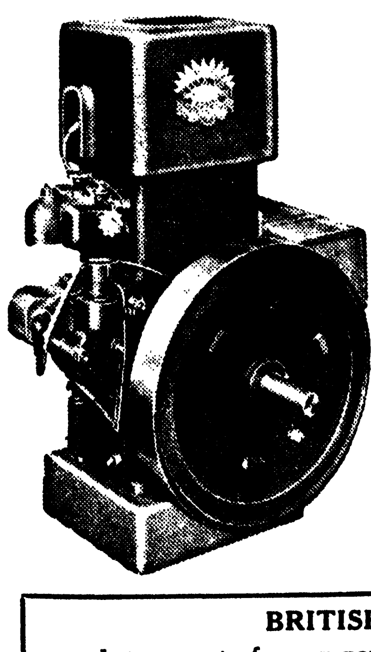

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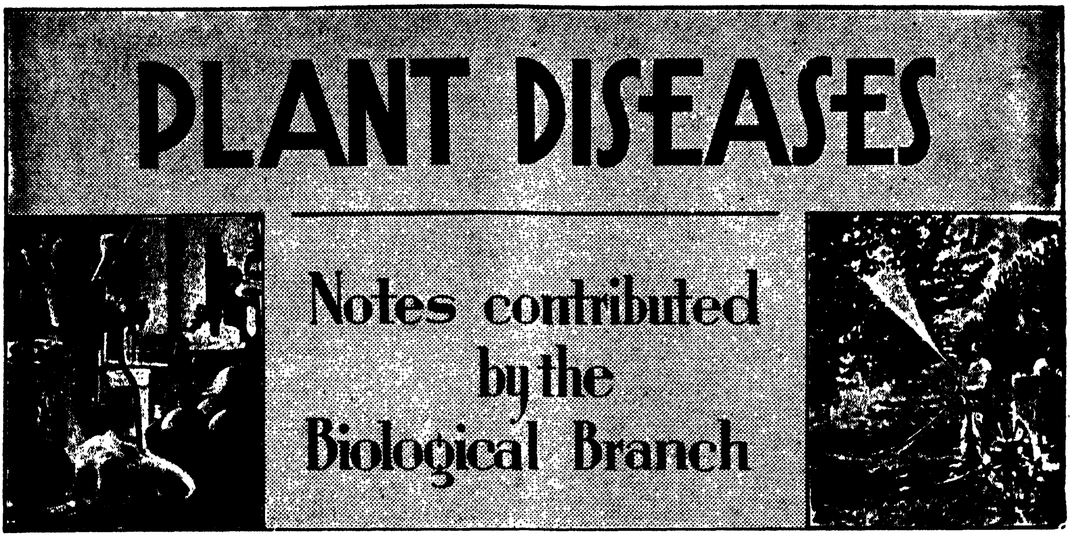

SEED TREATMENTS OF WHEAT, OATS AND BARLEY.

DURING the war years there has been a noticeable increase in the smut diseases of cereals in this State. Some of this increase has been due to the seasons being favourable to the development of smut diseases, but the greater part is attributable to neglect on the farmer's part to see that grain for seeding purposes has been correctly treated. Most of the grading and seed-treatment is done by contract, and the farmer should see that the seed is treated with the appropriate fungicidal seed dust at this time. Seed treatment is good insurance, as the benefits are great and the cost small.

Stinking Smut of Wheat.

In stinking smut or bunt the inside of the wheat grain is replaced by a black mass of smut spores. This mass of spores is enclosed in what appears to be the wall of the grain to form a "bunt ball" (Fig. 1). The glumes or chaff are not affected as in the case of "loose smut" or "flying smut." If a bunt ball is crushed between the fingers, the contents are observed in the form of a black and somewhat greasy powder. This powder is composed of myriads of spores of the fungus and serves to carry the disease over from one season to another. It has been calculated that the number of spores in a single bunt ball may range from four million to twelve million. There are thus sufficient spores in a single bunt ball, if regularly and evenly distributed, to provide each grain in a bushel of wheat with from four to eighteen spores.

Infection in a crop results from spores which are present on the seed at sowing. Thus a single bunt ball may infect a bushel

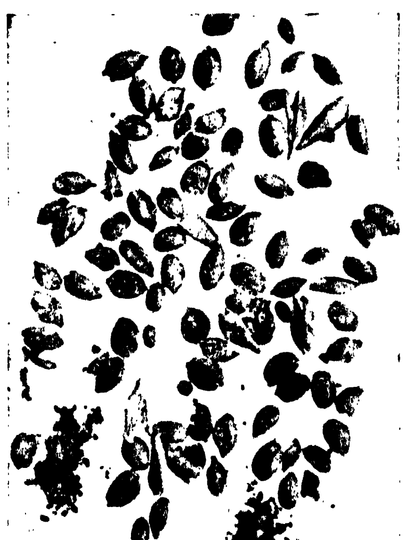

Fig. 1.—Bunt balls of the Stinking Smut or Bunt Disease of Wheat

Each of "grains of wheat" illustrated is a bunt ball. The inside of the grain has been wholly replaced by spores of the bunt fungus. Bunt balls are shorter than wheat grains.

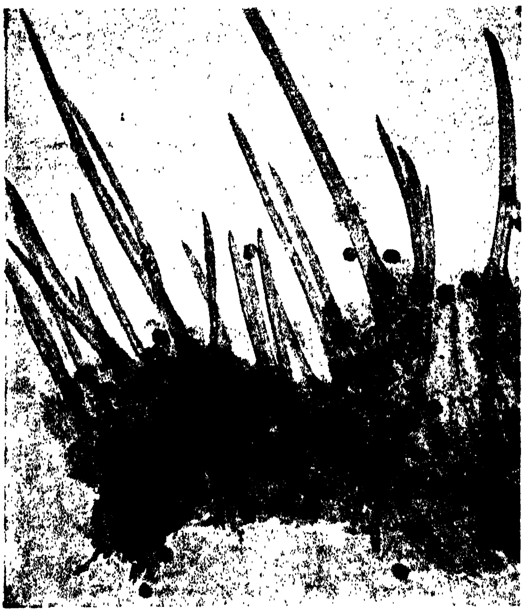

Fig. 2.—Portion of the End of a Wheat Grain.
Magnified to show spores of the bunt fungus caught in the hairs of the "brush". A comparison of the size of spores with the hairs on the grain is of interest.

of seed wheat and a very definite risk is involved in sowing untreated seed unless one is certain that not a single bunt ball was present in the crop from which the seed was obtained.

At heading, the infected plants can be readily picked out in the field because of the abnormal green colour of the ears. The colour is usually a darker-green than normal, and such ears remain green for a longer period than is the case with healthy plants.

Control.

Stinking smut can be easily controlled by seed treatment before sowing. Two distinct methods are available, viz., dry-dusting with copper carbonate, copper oxychloride or organic mercury preparations, and the wet pickle. The dry treatment has many advantages over the wet pickle, and it has now come into favour generally throughout the wheat-growing regions of the world. Satisfactory dusts suitable for seed treatment are available on the market under a number of trade names, e.g., Agrosan, Bunticide, Ceresan, Smutol, etc. It is recommended the directions given by the manufacturers be closely followed.

To prevent the irritating effects caused by the exposure of the operator to the dusts, to ensure that every grain is sufficiently coated with dust, and for greater convenience in treating a quantity of wheat, something in the nature of a dusting contrivance is necessary. For farm use an ordinary cask, fitted with slats inside to agitate the

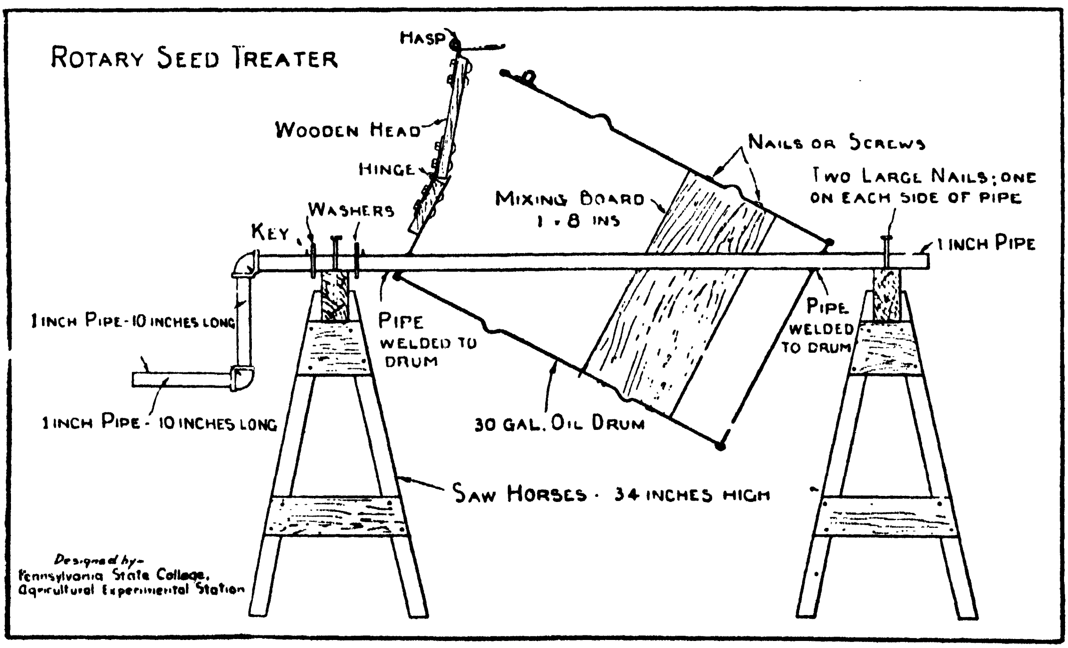

Fig. 3.—Diagram of machine suitable for dusting wheat, oats, or barley.

wheat, and mounted so that it can be easily revolved is really all that is necessary. The method of dusting is simply to pour a convenient measured quantity of the seed into the cask, add the dust and rotate the cask for two or three minutes (see Fig. 3).

Contract graders have introduced methods of dusting at the same time as grading. Farmers should make certain (*a*) that reputable dusts are being used, and (*b*) the grain is receiving a thorough coat of dust. The dusts should be used at the rate of 2 oz. per bushel or 6 oz. per bag.

Loose Smut of Wheat.

Loose smut of wheat is quite distinct from other smut diseases which occur on wheat and other cereals and grasses. The disease shows up conspicuously in the early heading stages of the crop, but becomes less noticeable as the crop matures.

The diseased heads are readily recognised by the black sooty powder which has replaced the grain and chaff. This powder is composed of the spores of the fungus, which are readily scattered by the wind, so that eventually only the central axis of the head is left (Fig. 4). Sometimes only some stalks of a plant are affected while the remainder are healthy. The looseness of the spores, however, will always readily enable the disease to be distinguished from bunt, the spores of which remain enclosed inside the aborted grain or bunt ball. Nor has loose smut any objectionable odour. The features of the life-history of the fungus are quite distinctive from bunt.

Control.

Pickling or dusting is of no value whatsoever in the control of this disease.

In some countries where this disease is very severe, hot water treatment of the seed for special plots is recommended. As a general practice we do not suggest this in New South Wales, although all pure seed wheat on the Department's Experiment Farms is hot water treated when the necessity arises. When loose smut is affecting a grower's wheat crops, new sources of seed wheat should be obtained either from the Department's Experiment Farms or other reliable sources.

Oat Smuts.

Two distinct types of oat smut occur in New South Wales (*a*) loose or open smut, caused by the parasitic fungus *Ustilago avenae*, and (*b*) covered smut, caused by the fungus *Ustilago levis*. Both diseases may be controlled by the same method of seed treatment; hence for all practical purposes the oat smuts may be considered as belonging to one group.

Fig. 4.—Showing all Stages in the Development of the Smutted Heads of the Loose Smut Disease of Wheat.
On the left is the head emerging from the sheath, and on extreme right is the bare stalk from which the "loose" spores have been blown.
[*After U.S.D.A.*

Loose smut is the most common form of the disease under local conditions. The heads or panicles are reduced in size and somewhat erect in contrast to normal healthy panicles. Later in the season the spores are blown away by the wind, leaving only bare stalks on the panicle (Fig. 5).

Covered smut differs from loose smut mainly in that it does not cause such extensive destruction of the glumes or chaff. The glumes are only partially destroyed, and the

spore masses of this fungus are not so readily broken up and scattered by the wind, and in nearly all cases are enclosed in a thin whitish membrane (Fig. 6).

Fig. 5.—Loose Smut Destroys the Oat Grains and the Enclosing Glumes or Chaff, and Reduces Them to a Mass of Black Sooty Powder.

The heads are reduced in size and are more erect than the normal. Later in the season the spores are blown away by the wind leaving only the bare stalks.

Varieties of oats vary in their susceptibility to smut, as follows:—

Highly resistant.—Lampton.

Moderately resistant.—Belar, Buddah, Gidgee, Mulga, Sunrise.

Susceptible.—Algerian, Burke, Fulghum, White Tartarian.

The seed of all susceptible and moderately resistant varieties should be treated, as recommended below, if sown for hay or grain.

Control.

The oat smuts can be most effectively controlled by the use of formalin, but unless precautions are taken some seed injury may result. The procedure is as follows:—

Place the grain on a tarpaulin or on a clean floor, and while shovelling sprinkle with formalin (1 lb. formalin to 40 gallons water) until the grain is uniformly but not excessively moistened.

A little less than a gallon of solution will be required per bushel of seed. The grain should then be covered for 4 to 5 hours with wet bags or canvas to retain the gas. If the right amount of solution has been added, the grain will absorb the moisture and, though swollen, should run freely through the drill. The grain should be bagged in clean bags to prevent reinfection and sown as soon as possible after treatment in formalin.

The proprietary organic mercurial dusts "Agrosan" and "Ceresan" are also recommended for control of oat smuts but the copper dusts are of little value against these diseases, except in the case of Skinless oats.

Fig. 6.—Covered Smut of Oats does Not Cause Such Extensive Destruction of the Glumes or Chaff, which are Only Partially Destroyed.

The spore masses are not so readily broken up or scattered by wind.

Barley Smuts.

Covered smut is so called because the smut mass occurs in place of grain in the heads of barley, but remains covered by a membrane somewhat resembling that found in bunt of wheat. Smutted heads may be threshed with clean ones and in this way the clean seed can become infected, the spores adhering to the outside of the seed and resulting in infection of the barley seedling.

Control.

Good control of this barley smut can be secured by the formalin treatment or dusting with one of the organic mercurials ("Agrosan" or "Ceresan") as outlined in the control for oat smuts. With the skinless barleys good control can be secured with copper dusts as indicated for seed wheat treatment.

Loose smut can be readily distinguished from the covered smut of barley by the appearance of the heads. The smut heads are ruptured fairly early and the spores are blown by the wind on to the flowers of the healthy plants. There they infect the seed. Such seed when sown produces smutted plants. Fungicidal treatment of the seed is wholly unsatisfactory. This disease is very similar to loose smut of wheat and the control measures suggested there apply to this disease also.

South Coast and Southern Highland Primary Industries.

(*Continued from page* 120.)

It was fortunate that the machinery in the woollen mills in France and Belgium was practically intact, said Mr. Coleman, and it was expected that these countries would be manufacturing again in the near future. It was also possible that countries which were non-users of wool pre-war, such as Russia and China, would become users and help to reduce the surplus quicker than would otherwise be the case. Another factor which might influence the position was the great increase in lamb production in some countries, such as New Zealand and South America. This had meant an increase in the proportion of crossbred wool produced.

Mr. Coleman exhibited numerous samples of materials made from synthetic fibres alone, and in various proportions with wool. He said that the manufacturers of synthetics had never claimed that their products were as good as wool, but they "would do." Production and consumption of synthetics now exceeded those of wool. Synthetic materials were good and cheap; they could be produced on cotton machinery and needed no carbonising; there was little difference in the cost of different grades and there was a degree of price stability. Wool certainly had many advantages over synthetics, such as tensile strength, ability to bend, warmth, etc., but these were largely offset by economic conditions.

Synthetics had first been evolved in Germany, Japan and Italy. Production had increased greatly in recent years and such fibres were now also largely produced in United States of America and Great Britain. German synthetics were mostly made from the Scandinavian forests and Italian fibres from milk, which because it was a foodstuff would limit this type of product. Nylon was made in United States of America, as were the soybean and mineral fibres.

It would be seen that competition from synthetic fibres was serious, and that they were thus a menace to the wool industry. The answer to their challenge, said Mr. Coleman, was quality in wool—which could only be ensured by good breeding, feeding and management.

Suspension of Provisions of Horse Breeding Act.

THOSE provisions of the Horse Breeding Act, 1940, which require the registration of stallions have been suspended for a further period of one year from 1st February, 1946.

It is still necessary, however, for persons who have not at any time notified the Department of the ownership of a stallion to do so, and also to notify it of the death, transfer or castration of any stallion to which the provisions of the Act apply.—MAX HENRY, Chief, Division of Animal Industry.

Seed Wheat and Oats for 1946 Sowing

List of Growers of Approved Seed.

IT has been decided to publish again this year a list of growers of approved seed wheat and oats who have supplies available for sale. The crops of the growers listed were inspected by officers of the Department and reached a standard of purity and trueness to type up to the approved standard.

Growers listed should notify the Department immediately their available seed of any variety is exhausted.

Wheat.

Bencubbin.—
Carney, C., "Maranoa," Ulamambri.
Ward, H. E., "Gwenvale," Parkes.
Harley, H. J., "Wattle Park," Tulligibeal.
Cullen Bros., Bunglegumbie, via Dubbo.
Donnett, H., "Braemar," Gulargambone.
Idiens, E., "Kangarooby," Gooloogong.

Bordan.—
Dunkley, A. D., "Bon Lea," Brundah, via Grenfell.

Bungulla.—
Heckendorf, H. F., "Noorongong," Forbes.

Eureka.—
Idiens, E., "Kangarooby," Gooloogong.

Ford.—
Hall Bros., "Ellerslie," Wallendbeen.
Howard, G., Kallara, Springdale.
Fitzgerald, K., Box 294, Griffith.
Downing, R., "Merton," Dubbo.
Donnett, H., "Braemar," Gulargambone.
Idiens, E., "Kangarooby," Gooloogong.
Robson, C. C., "Norcia," Rivers Road, Canowindra.
McDonald, H. H., "Belmont," Canowindra.

Gular.—
Cullen Bros., Bunglegumbie, via Dubbo.
Byrnes, E., "Glen Ayr," Burnett.

Javelin.—
Carr, R. T., "Enfield," West Wyalong.

Koala.—
Heckendorf, H. F., "Noorongong," Forbes.

Rapier.—
Carney, C., "Maranoa," Ulamambri.
Carr, R. T., "Enfield," West Wyalong.
Ward, H. E., "Gwenvale," Parkes.
Idiens, E., "Kangarooby," Gooloogong.

Waratah.—
Bradford, R., "Cooringle," Nubba.
Idiens, E., "Kangarooby," Gooloogong.

Oats.

Algerian.—
Wilson, R. & Sons, "Fairview," Oberon.
Dickson, A. S., "Yurunga," Oberon.
Witten, R. A., "Willowbank," Oberon.
Howard, G., "Kallara," Springdale.
Burns, W., Goongirwarrie, Carcoar.

Belar.—
Hall Bros., "Ellerslie," Wallendbeen.
Hill, A. H., "Carawatha," New Molyan, via Mendooran.
Witten, R. A., "Willowbank," Oberon.
Uther, L. F., "Myonah," Cowra.
Ward, H. E., "Gwenvale," Parkes.
Cullen Bros., Bunglegumbie, via Dubbo.
Idiens, H., "Kangarooby," Gooloogong.

Brigalow.—
Wilson, R. & Sons, "Fairview," Oberon.
Gardiner, A. K., Claremont, King's Plain, Blayney.

Fulghum.—
Crick, P., "Mayfair," Gollan.

Kurrajong.—
Ward, H. E., "Gwenvale," Parkes.

Barley.

Abyssinian.—
Idiens, H., "Kangarooby," Gooloogong.

Award of Agricultural Bureau Scholarship.

THE Minister for Agriculture, Mr. Graham, announces that the scholarship donated by the Agricultural Bureau of New South Wales and tenable at Hawkesbury Agricultural College has been awarded to Ronald Edward McCormac, son of Mr. and Mrs. E. N. McCormac, of Gosford.

The successful candidate was educated at Gosford High School and qualified at the Intermediate Certificate Examination in 1945, securing a pass in seven subjects, viz., English, General Mathematics, Agriculture, Science, Geography, Woodwork and Metalwork. He is interested in both agriculture and livestock, and during the school vacations took the opportunity of gaining experience on his uncle's dairy farm in the Bellinger River district. His father was a member of the A.I.F.

The scholarship was awarded by a Committee comprising representatives of the Agricultural Bureau of New South Wales, the Department of Agriculture and Hawkesbury Agricultural College.

THE CITRUS INDUSTRY OUTLOOK.

Potentialities of the Local Market.

R. J. BENTON, H.D.A.,
Special Agricultural Instructor.

A Coastal Citrus Orchard, Well Protected by Hills and Virgin Timber.

STABILITY in the citrus growing industry—the avoidance of alternating periods of boom and depression—can only be attained by long-range planning, and such planning is only possible through organised groups of enlightened individual growers. The prime objective of the industry must be to make available to the consumer fruit of dependable quality at a price which is mutually satisfactory. The achievement of this objective will involve the close scrutiny of many practices, and considerable adjustment of methods of distribution as well as methods of production.

In the past the marketing of citrus in Australia has largely been confined to the State in which the fruit was produced, but improved transport, on land and in the air, is likely greatly to widen the range of distribution. The natural development will be toward more centralised production for regulated distribution on an Australia-wide market. One its present buying capacity, certainly, that market is under-supplied.

Extension of Planting is an Industry Matter.

How well the industry will weather any decline in this demand will depend upon its ability to take an all-over view of its operations and make the necessary adjustments. The extent to which extension of plantings is now justified is a matter to be carefully considered by the industry as a whole, and not merely guessed at by individual growers. Fortunately for prospective soldier settlers, shortage of nursery trees has acted as a curb on boom-time expansion. Because of this shortage, it will be some years, at least, before production can catch up with the demand at the present level. Growers may be warned, on the other hand, that the days when it was possible to dispose of any fruit which had some resemblance to its species are numbered—and properly so.

Oversea Position Unchanged.

Regarding outlets overseas for citrus fruit, it is not believed that this will be much better in the post-war period. In pre-war days export of citrus fruit fluctuated, but approximated 500,000 cases, the majority of which was sold in New Zealand with lesser quantities to Canada and the Far East. It is not likely that that position will materially alter. Even with faster means of transport, the European market is not likely to become attractive because of greatly increased plantings in U.S.A., the development of canned juice and the large production in

Brazil and South Africa, each being nearer European markets and capable of great expansion at low cost of development.

Efficiency is the Key to Success.

As indicated, however, there is a local market which has yet to be satisfied. In the problem of its exploitation there are admittedly factors beyond the control of the grower, such as the buying capacity of the consumer. To come to economic terms with this is likely to be more difficult than it has been in recent years, but to a large extent, as in all businesses, it is a matter of efficiency in methods of production and sale.

Methods of citrus production are fully discussed in a recently revised and enlarged departmental pamphlet entitled "Citrus Culture." It is obtainable free on application to the Division of Information and Extension Services, Department of Agriculture, Box 36A, G.P.O., Sydney.

BORON DEFICIENCY IN APPLES.

Observations at New England Experiment Farm.

(*Continued from page* 80.)

J. A. HOLBECHE, H.D.A., Fruit Instructor.

IN this continuation of this article (which commenced in January issue) the author deals with experiments concerning the application of borax spray combinations, the general effects of borax on fruit and tree condition, and with cold storage tests of the effects of borax treatments.

Applications of Borax Spray Combinations.

Experiment No. 1.—An experiment designed to ascertain the concentration required for effective control, combining of sprays and period of effectiveness.

1. Variety—Granny Smith.
   Soil type—Grey brown medium clay over grey brown heavy clay.
   Age—40 years.
   Average height of trees—12 feet.
   Average spread of limbs—15 feet.
   Average circumference of trunk—30 inches—measurements taken 6 inches from ground level.

Prior to commencement of treatments fruits from all trees were severely to very severely affected with corking.

2. Variety.—Jonathan.
   Soil type—Brownish grey concretionary light clay over light brown heavy clay.
   Age—20 to 30 years.
   Average height of trees—10 feet.
   Average spread of limbs—14 feet.
   Average circumference of trunk—21 inches—measurements taken 6 inches from ground level.

Prior to commencement of treatments fruits from all trees were severely to very severely affected with corking.

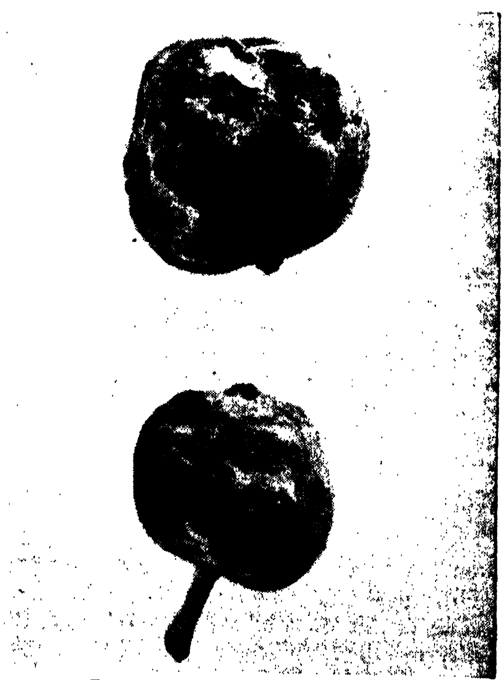

Fig. 9.—Superficial Cork—Jonathan.

AVERAGE Cork as a Percentage for Each Plot.

Treatment.	Year Recorded.	" Internal " Cork and Corky Core.		Superficial and " Crinkle " Cork.		Total Corking.	
		Jonathan.	Granny Smith.	Jonathan.	Granny Smith.	Jonathan.	Granny Smith.
No Treatment	1938	70·5	36·25	25	18·75	95·5	55·0
	1939	50	5	8	nil.	58·0	5·0
	1940	73	51·75	3	13·25	76·0	65·0
	1941	63·5	15·75	12	4·75	75·5	20·5
	1942	37	3·75	15	14·5	52·0	18·25
1. Sprayed at green tip stage. 1% borax combined lime sulphur 1–20, Applied 1937, 1938, 1939 (3 years).	1938	11	No trace.	4	No trace.	15·0	nil.
	1939	11	No trace.	No trace.	No trace.	11·0	nil.
	1940	7	No trace.	No trace.	No trace.	7·0	nil.
	1941	No trace.	No trace.	No trace.	No trace.	nil.	nil.
	1942	No trace.	No record.	No trace.	No record.	nil.	No record.
2. Sprayed 1st week November, 25% borax solution combined with lime-sulphur and arsenate of lead. Applied 1937, 1939 (2 years).	1938	No trace.	No trace.	9	No trace.	9·0	nil.
	1939	No trace.	No trace.	No trace.	No trace.	nil.	nil.
	1940	No trace.	No trace.	No trace.	No trace.	nil.	nil.
	1941	No trace.	3	3	No trace.	3·0	3·0
	1942	4	No trace.	2	No trace.	6·8	nil.
3. Same combinations as above applied 1st and 4th week November, 1937, 1938 and 1939 (3 years).	1938	No trace.	8	13	11	13·0	19·0
	1939	No trace.	No trace.	No trace.	No trace.	nil.	nil.
	1940	No trace.	No trace.	No trace.	No trace.	nil.	nil.
	1941	3	No trace.	No trace.	No trace.	3·0	nil.
	1942	1	1	1	No trace.	2·0	1·0
4. Sprayed 1st week November, 25% borax solution combined with lime-sulphur only. Applied 1937, 1938, 1939 (3 years).	1938	2	No trace.	29	No trace.	31·0	nil.
	1939	No trace.	No trace.	No trace.	No trace.	nil.	nil.
	1940	No trace.	No trace.	No trace.	No trace.	nil.	nil.
	1941	No trace.	No trace.	No trace.	No trace.	nil.	nil.
	1942	6	2	8	No trace.	14·0	2·8
5. Same combination as above. Applied 1st and 4th week November, 1937, 1938 and 1939 (3 years).	1938	12	No trace.	18	No trace.	30·0	nil.
	1939	No trace.	No trace.	No trace.	No trace.	nil.	nil.
	1940	No trace.	No trace.	No trace.	No trace.	nil.	nil.
	1941	3	No trace.	2	No trace.	5·0	nil.
	1942	10	1	No trace.	No trace.	10·0	1·0
6. Sprayed 1st week November, 25% borax solution combined with arsenate of lead. Applied 1937, 1938, 1939 (3 years).	1938	No trace.	No trace.	13	No trace.	13·0	nil.
	1939	No trace.	No trace.	No trace.	No trace.	nil.	nil.
	1940	No trace.	No trace.	No trace	No trace.	nil.	nil.
	1941	1	No trace.	1	No trace.	2·0	nil.
	1942	3	1	3	No trace.	6·0	1·0
7. Same combination as above. Applied 1st and 4th week November, 1937, 1938 and 1939 (3 years).	1938	No record.	9	No trace.	No trace.	No record.	9·0
	1939	No trace.	No trace.	No trace.	No trace.	nil.	nil.
	1940	No trace.	No trace.	No trace.	No trace.	nil.	nil.
	1941	7	No trace.	No trace.	No trace.	7·0	nil.
	1942	19	2	2	No trace.	21·0	2·0
8. Sprayed 1st week November, 25% borax solution only. Applied 1937, 1939 (2 years).	1938	No trace.	No trace.	5	No trace.	5·0	nil.
	1939	No trace.	12	No trace.	No trace.	nil.	12·0
	1940	No trace.	No trace.	No trace.	No trace.	nil.	nil.
	1941	No trace.	No trace.	No trace.	No trace.	nil.	nil.
	1942	7	4	2	No trace.	9·0	4·0
9. Same as above. Applied 1st and 4th week November, 1937, 1938 and 1939 (3 years).	1938	32·0	No trace.	20	4	52·0	4·0
	1939	No trace.	1	No trace.	No trace.	nil.	1·0
	1940	No trace.	No trace.	No trace.	No trace.	nil.	nil.
	1941	1	No trace.	No trace.	No trace.	1·0	nil.
	1942	18	2	2	No trace.	20·0	2·0
10. Sprayed 1% borax solution combined with arsenate of lead and white oil 1–100. Applied 4th week November, 1937, 1939 (2 years).	1938	33	12	47	11	80·0	23·0
	1939	No trace.	No trace.	No trace.	No trace.	nil.	nil.
	1940	2	No trace.	No trace.	No trace.	2·0	nil.
	1941	1	No trace.	No trace.	No trace.	1·0	nil.
	1942	2	5	No trace.	No trace.	2·0	5·0

Spray Applications of Borax to Apple Trees During the Dormant Period.

A number of Granny Smith apple trees were sprayed with a 1 per cent. borax solution during the months of June, July and August. From the results obtained it appears that borax when applied as a spray to trees during the winter months is quite ineffective in controlling cork.

Borax Sprays—Summary of Results.

(*a*) *Spray Concentration Required to Give Effective Control of Cork.*—The control obtained by the use of borax sprays

varies considerably. It is indicated that a .25 per cent. borax solution can be quite effective in controlling cork, particularly during the second year of application. Tests have shown that under certain conditions no damage to trees has occurred even when a 2 per cent. solution of borax is applied. Results indicate that apple leaves have a fairly high tolerance for borax in solution. When the leaves of young trees were burned with 4 per cent. to 10 per cent. borax solutions, they recovered rapidly and the new growth showed no permanent injury.

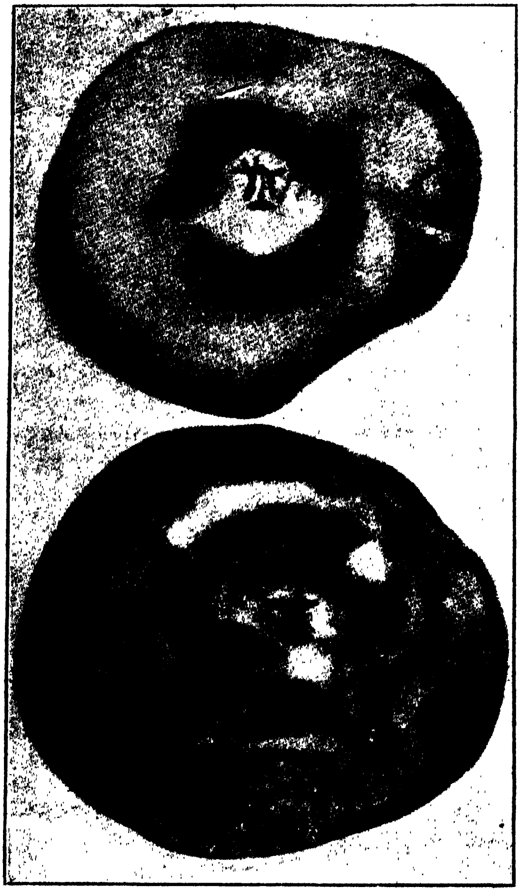

Fig. 10.—Crinkle associated with Cork, Democrat.

(*b*) *Period of Effectiveness.*—Where trees were sprayed with a borax solution for two and three years in succession and then not sprayed, the percentage of fruits affected with corking the first year was only very slight. However, the percentage of affected fruits the second year, when trees were not sprayed for two years after successive treatments was noticeably increased.

Borax Sprays—Period of Effectiveness, Percentage of Total Corking.

Treatment.	Granny Smith.		Jonathan.	
	No treatment for 1 year.	No treatment for 2 years.	No treatment for 1 year.	No treatment for 2 years.
Sprayed plots.				
No. 1	nil	No record	nil	nil
2	3·0	nil	3·0	6·0
3	nil	1·0	3·0	2·0
4	nil	2·0	nil	14·0
5	nil	1·0	5·0	10·0
6	nil	1·0	2·0	6·0
7	nil	2·0	7·0	21·0
8	nil	4·0	nil	9·0
9	nil	2·0	1·0	20·0
10	nil	5·0	1·0	2·0
No treatment trees—same year for comparison	20·5	18·25	75·5	52·0

Fig. 11.—Cork Lesions, Democrat.

All sprayed trees were treated for two and three years, then were not treated for two years.


* CUPROX
Copper Fungicidal Spray.
* PHYOMONE
Prevents pre-harvest drop.
* SHIRLAN AG
Prevents Mould and Mildew.
* WINTER WASH "A"
For control of green and black aphis.
* HORTOMONE "A"
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(*c*) *Combining of the Sprays.*—From observations and results obtained it appears that a borax solution may be safely combined with arsenate of lead, lime sulphur or white oil at recommended strengths.

(*d*) *When to Apply.*—The results obtained do not indicate that any one of the periods selected for spraying in the tests was more suitable than the others. The application of a spray during the first week of November, which at Glen Innes coincided with the usual calyx spray would appear to be most convenient and quite effective. As the appearance of cork in the fruits has been noted as early as the end of October, sprays applied after the first week of November may prove quite ineffective.

(*e*) *Effects of Sprays on*—(1) Blossoming.—No difference between treated and untreated plots could be noted.

(2) Growth.—Generally, treated trees showed much improvement; their leaves were noticeably a darker green compared with those on untreated trees. Treated trees held their leaves until late in the season after all others were defoliated.

(3) Fruits.—A general improvement in appearance and quality was noted. Granny Smith fruits retained their green colour longer than those from untreated trees, while Jonathans were noticeably much brighter.

Fruits from sprayed trees even when slightly affected with cork were of much better quality than those from untreated trees. The flesh texture and juice content of fruits was normal after treatment.

General Effects of Borax on Fruit and Tree Condition.

(*a*) *Fruits.*—A marked improvement in the quality of the fruit was noted where trees had received borax. Except where very heavy dressings were applied, the fruits were normal in appearance, and even when cork was noted it was present only in a very slight form. The general improvement in the shape and colour of treated fruits was very marked. Granny Smiths were a bright green colour compared with the dull yellowish fruits on no treatment trees.

Fruits on treated trees developed normally and did not fall prematurely.

The flesh texture and flavour was excellent in most fruits from treated trees compared with the tough, dry flesh of fruits from no treatment trees.

Where trees received 6 to 10 lb. of borax over two years, the condition of the fruit was very poor. The shape of the fruit and the colour, although quite distinct, was not adversely affected. The flesh and flavour, however, were very adversely affected—usually fruits were soft and unpalatable.

Fruits from trees which received a soil dressing of 1 lb. borax were slightly superior in appearance, texture and flavour to those from sprayed trees.

(*b*) *Tree Condition.*—The treatments did not appear to have any effect on the blossoming.

Except where excessive amounts of borax were applied, no damage to any part of the trees was apparent. A general improvement in the tree growth was noticed, except where excessive amounts of borax were applied. The annual growth of treated trees was increased but the most noticeable effect was in the leaf colour. This was a much darker green where treated and the leaves remained on the trees longer in the autumn. Leaves on sprayed trees remained longer than all others.

It is of interest to note that during the first year after 1 lb. or more of borax was applied to the soil, no weed growth occurred on the treated areas.

Cold Storage Tests—Effects of Borax Treatments.

A number of varieties of apples were included in the cold storage tests, but generally the results obtained with Jonathan and Granny Smith can be taken as a fair indication of the effects on all fruits.

Each year one and in some cases two, bushels of fruit were stored, from each plot. All varieties were wrapped in sulphide paper except Granny Smith, for which oiled wraps were used.

Fruits from trees which received no treatment, in most cases, showed a high percentage of corking, but an effort was made to exclude from the packs any severely malformed fruits.

The fruits were stored under normal cold storage conditions for periods ranging from 2½ to 5 months for Jonathans and 5½ to 7 months for Granny Smiths.

When removed from store all fruits were examined immediately, and then kept under observation for a period of two to three weeks.

Results.—Fruits of both varieties in plots which were treated with 1 lb. borax per tree showed the lowest percentage of flesh breakdown. Each variety also showed that the highest percentage of flesh breakdown is found in plots treated with 3 and 5 lb. of borax.

Jonathan fruits in the 1 lb. of borax plots were, together with the no treatment fruits, the least affected with Jonathan Spot.

Generally, fruits from trees which received 1 lb. of borax for one and two years were superior to all others.

GENERAL OBSERVATIONS ON FLESH CONDITION, FLAVOUR AND SKIN COLOUR OF STORED FRUITS.

1. *Flesh Condition.*—(A). Granny Smiths—usually the flesh of fruits in the no treatment plots was dry and tough compared with that of fruits in the 1 lb. of borax plot.

In the 5 lb. of borax plots the flesh was always very soft, but fairly juicy. Within a few days after removal from store, these fruits were not fit for consumption.

Fruit from the sprayed plots usually showed a flesh inclined to be floury compared with the crisp, normal flesh of fruits in the 1 lb. borax plots.

(B). Jonathan.—The flesh condition was similar to Granny Smith. In the 5 lb. borax plot the flesh was very poor. Fruits in the 1 lb borax plot were superior to all others.

2. *Flavour.*—(A). Granny Smith—the poorest fruits were found in the 5 lb. borax plot. Some fruits in this plot were very unpalatable. The flavour of fruits in the no treatment plot was also very poor.

(B). Jonathan—similar to Granny Smith with the exception that there was little difference in the flavour of fruits in any plots except the 3 and 4 lb. borax ones; these were very poor.

3. *Colour.*—The following gives an indication of the effects of borax on the skin colour of fruits. The variety was Cleopatra after two months in common store, and one bushel case of fruit in each treatment was examined.

Treatment.	Skin colour.	
	Very yellow to yellow.	Green.
1 lb. of borax	86 per cent.	14 per cent.
5 lb. of borax	70 per cent.	30 per cent.
No treatment	100 per cent.	nil.

Generally Granny Smiths in the 5 lb. borax plot retained their green colour for a longer period after removal from store, than any others. The colour in the 1 lb. borax plot was even, while in the no treatment and sprayed plots the fruits yellowed ahead of the others and the colour was very variable.

The skin colour in Jonathans did not differ very much between the plots, but generallv the red colour in fruits from the no treatment and 3 to 4 lb. borax plots, was dull.

The beneficial effect of borax on the green colour in Granny Smith apples has been demonstrated in an article by J. D. Bryden, describing the results obtained at Wagga Experiment Farm where boron deficiency does not occur (*Agric. Gazette N.S.W.* September, 1940, p. 525).

CONCLUSIONS.

The tests show that where fruits are suffering from boron deficiency their keeping quality can be greatly improved by the use of borax.

The condition and life of fruits in cold store is not adversely affected by the borax, except when excessive amounts are applied to the tree.

(To be concluded.)

Newcastle Disease of Poultry.

Danger from Illegal Introduction of Other Birds.

ADVICE has been received from South Africa that Newcastle disease, one of the most serious epizootic and fatal diseases of poultry, has appeared in that country, and there is strong suspicion that the disease was introduced by illegal landing of birds from ships coming from the East.

The danger which threatened South Africa also threatens Australia, and very serious consequences might follow the illegal landing of birds from ships. The disease can be spread by birds other than poultry. It was once introduced into Australia and stamped out at heavy cost. This is a further reminder of the necessity for strict quarantine measures in connection with the introduction of birds and animals into this country.—MAX HENRY, Chief, Division of Animal Industry.

INSECT PESTS.
Notes contributed by the Entomological branch

The Bean Fly *(Agromyza phaseoli).*

GROWERS are reminded that, to control this pest, a regular spray programme must be adhered to, in order to destroy the eggs and larvae from time to time in the leaf-blades. This is most important, as when the maggots enter the leaf-stalks or the stems, they are not affected by the spray, and the neglect of even a day in the routine applications may enable sufficient maggots to enter the stems to cause serious injury.

The bean fly, which is mainly a coastal pest in this State, infests all varieties of climbing or bush types of edible beans of the genus Phaseolus.

The adults are minute, black flies which measure about one-twelfth of an inch in length, and they may be seen on the leaves as soon as the plants are well through the ground. The eggs, which are laid singly in the upper surfaces of the leaves, hatch within two days in warm weather, and the young maggots or larvae at first tunnel through the leaf, then commence to burrow down the leaf-stalk and finally make their way down through the stem.

The maggots, which become fully-fed in about eight or nine days, enter their pupal or chrysalis stage within the stems and about nine or ten days later emerge as adult flies.

The life-cycle from egg to adult may occupy less than three weeks in summer, but under cooler conditions may be almost three and a half months.

There is a heavy mortality of all stages of the insect during the winter, and this, together with the slower rate of development, results in only a few flies surviving to infest spring crops. Infestations, therefore, are usually extremely light in all sowings made between June and October.

In most areas, however, by about the end of December, the flies have so increased in numbers that infestations are severe in sowings made at this period and continue to be so, along the central coast, until about the end of April, and on the north coast, until about the end of May.

As the larvae destroy all the inner tissues of the stems, severely infested plants turn yellow when they are about eight to ten days old and commence to fall over and to die off. In lighter infestations the plants become yellow and their stems swollen and cracked, and they are readily broken off by the wind, but otherwise their yield may be satisfactory unless weather conditions are dry.

Control.

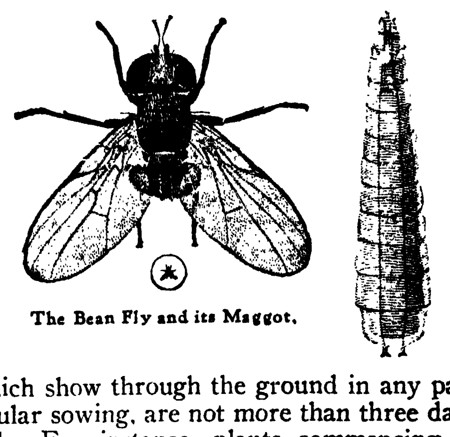
The following spray is recommended for the control of this pest:—

Nicotine sulphate, 1 fluid oz.

White oil emulsion, 6½ fluid oz.

Water, 4 gallons.

It is important that the first application of spray be made when the first plants



The Bean Fly and its Maggot.

which show through the ground in any particular sowing, are not more than three days old. For instance, plants commencing to show, say Monday morning, should be sprayed on Wednesday. The second spraying should be made three days after the

first, and subsequent applications at intervals of four days.

In most areas, sowings made in January and February and up to the middle of March, should be sprayed six or eight times, or until blossoming commences; sowings made during the latter half of March, at the approach of cool weather, require four to six applications; later plantings still, in April, usually require two to four sprays.

Only the upper surfaces of the leaves should be sprayed, and 40 gallons of spray mixture is usually more than sufficient to spray an acre once.

Mole Crickets (*Gryllotalpa* spp.)

DURING the past few months, mole crickets have been reported causing serious damage to seed beds, by burrowing through the soil beneath the plants, thus causing the roots to dry out and the plants to die.

In their immature and adult stages mole crickets may cause extensive injury to lawns, golf and bowling greens and tennis courts; their horizontal tunnelling just beneath the soil level destroys the smooth surface of the turf and causes injury to the grass. In addition, small mounds of soil are frequently thrown up amongst the grass, causing further unevenness. In one instance more than seven hundred mole crickets were taken from a single golf green.

Mole crickets may also occur in numbers in gardens, but well-rooted plants do not usually suffer appreciable injury. Where crickets occur in seed beds, or amongst young plants, however, they may cause serious damage by churning up the soil, thus causing the small plants or germinating seeds to die.

Some seven species of the genus *Gryllotalpa* are found in Australia, and of these, two species, *G. africana,* an introduced form and *G. australis,* occur as pests in New South Wales.

Both are dull, yellowish-brown to dark-brown insects, with black eyes, and measure about 1¼ inches in length when mature. Their powerful front legs, which are particularly adapted for digging, are broadly flattened and bear tooth-like projections. The soft wingcovers (tegmina) are short and rounded, while the hindwings, which are well-developed, are folded when not in use and project backwards beyond the wing-covers. At the tip of the abdomen there is a pair of feeler-like appendages or cerci. Although the adults are able to fly, they are seldom observed in flight.

Mole crickets are able to produce loud stridulations or "songs" by vibrations of the wingcovers, upon which are situated special structures or files. Their organs of hearing or "ears" are situated on the tibiae of the front legs.

The adults live in galleries or tunnels under the soil, and usually prefer sandy soils in moist situations. They construct vertical shafts, about 6 inches or more in depth at the ends of their galleries. Occasionally, at night, they come out into the open, but always shelter in the vertical tunnels during the day.

Mole crickets are omnivorous feeders and burrow through the ground and amongst the roots of plants to obtain earthworms and various insects. They also feed on organic matter in the soil, grass roots, the roots and stems of seedlings, the roots of maize, sugar cane and vegetables, and also gnaw through succulent stems at ground level. There are also records of mole crickets collecting germinating wheat and other seeds and storing them in circular chambers some 6 to 12 inches underground, and in some instances they have been known to remove every seed from areas several square yards in extent. Cannibalism also occurs amongst them and the younger forms succumb to attacks of mature specimens.

Mole crickets may be attacked by mites, parasitic nematode worms and thynnid wasps.

Life History.

The females construct one or more egg-chambers and in these they deposit their eggs. About 200 eggs have been found in a single chamber. The eggs, which measure slightly less than ⅛ inch in length, are ovoid and brown in colour. The newly-hatched crickets, which measure about 1/5th inch, are active and greyish-brown in colour, and they increase in size by a series of six moults before reaching the adult stage. In their immature stages they resemble the adults in general form, but lack wings.

Egg-laying has been observed to occur from November right through the summer

months, but the young which hatch from these eggs do not reach maturity until the following spring and summer, and while there appears to be only one generation each year, all stages may be observed during the summer months because of the prolonged oviposition period. In general, however, adults predominate in the early summer while immature forms are mainly seen in the late summer and through the autumn and winter.

Control.

As previously stated, the presence of mole crickets may be detected by the unevenness caused to the ground or grass, by the horizontal tunnels and the small mounds of earth. If the horizontal tunnels are followed, the vertical shafts, in which the crickets shelter by day, can be located. The introduction of an irritant contact insecticide into these shafts, either by means of a syringe or funnel, will cause the sheltering crickets to make their way to the surface, where they can readily be collected and destroyed.

It is essential that any mixtures used should not injure the grass or other plant life. A satisfactory solution for this purpose is a nicotine sulphate and soap solution, used at the rate of:—

Nicotine sulphate, 1 fluid oz.
Hard soap, 3 oz.
Water, 4 gallons.

The following mixture has also been found very effective:—

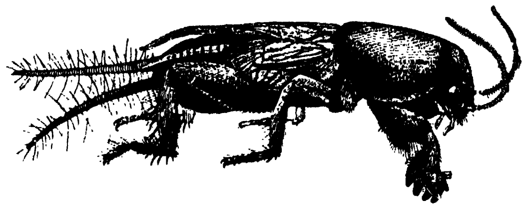
Derris powder (pure), 1 oz.
Soft soap, 3 oz.
Water, 3 gallons.

Under certain circumstances a kerosene emulsion may be used to bring the crickets to the surface, but concentrated solutions of this emulsion will cause burning of grass roots around the treated areas.

An emulsion of eucalyptus, prepared with soft soap, has also been found effective.

Where areas are heavily infested, however, locating the vertical tunnels and injecting the insecticide is a very laborious process, and it is easier, although more expensive, to flood the area with one of the above mixtures—a much greater quantity of liquid being required for effective results.

The injection of infested turf with carbon bisulphide is also a very effective method of control. Carbon bisulphide, however, has to be injected with a special injector, so that it can be placed below the surface level to a depth of 4 to 5 inches as this chemical is injurious to the grass. To be effective, it is necessary to inject ¼ fluid oz. into at least every square



An Adult Mole Cricket.

foot throughout the infested area. Carbon bisulphide is an evil-smelling, colourless liquid, which gives off a gas that is toxic to the crickets. It is extremely inflammable and explosive and all lights or fires should be kept well away during treatment.

It has been observed that lawns which have been "grub-proofed" with arsenate of lead are noticeably free of mole crickets. "Grub-proofing" of lawns and golf greens is usually undertaken to control scarab beetle larvae, popularly known as "white curl grubs," and the method generally adopted is to mix 5 lb. of arsenate of lead powder with 1 bushel (approximately 2 kerosene tins) of screened moist (not wet) sand or a good top soil, and then to distribute the poisoned sand or soil evenly over 1,000 square feet of turf. The poisoned soil is applied to the lawn when the grass is dry, and in order to build up a layer of poisoned soil this top dressing is repeated three years in succession.

A Mole Cricket Bait.

A bait which has proved of value for the control of mole crickets in seed-beds consists of:—

Broken rice, 5 lb.
Barium fluosilicate, 4 oz.

The method of preparing the bait is first to moisten the rice with about a pint of water. Then spread out the grain on sheets of paper and scatter the poison over it; mix thoroughly and allow to dry. The bait is then ready for use, or may be stored if not required immediately.

In ground which is known to be infested, the poisoned rice may be lightly worked into the surface soil some days before planting,

or may be broadcast over the surface of the beds if the seeds have already been planted. The bait is best applied in the late afternoon or evening after irrigation or rain, when the crickets come to the surface. The bait remains toxic for a week or more, but as the grain becomes moist in the soil it eventually rots and becomes less attractive. A second treatment after an interval of a week may prove necessary.

If broken rice is not obtainable for the preparation of this poison bait, it is suggested that some other type of broken hard grain may be used as a substitute.

Domestic animals are not attracted to the bait but poultry should not be allowed on treated land for at least a week after application of the bait.

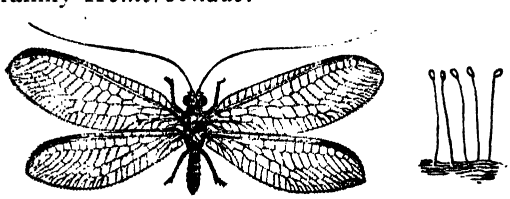
Beneficial Insects.

Lacewings (Order Neuroptera).

THE adults of lacewings are mostly small, fragile insects, and, as their popular name indicates, have numerous lace-like veins in their two pairs of wings. The adults are often attracted to lights at night.

Lacewings are widely distributed in New South Wales, and are commonly found in the orchard or garden, where their larvae feed upon scale insects, aphids and other small insects.

There are two commonly occurring families, viz., the green lacewings, family *Chrysopidae,* and the brown lacewings, family *Hemerobiidae.*



1.

The Green Lacewing and Eggs.

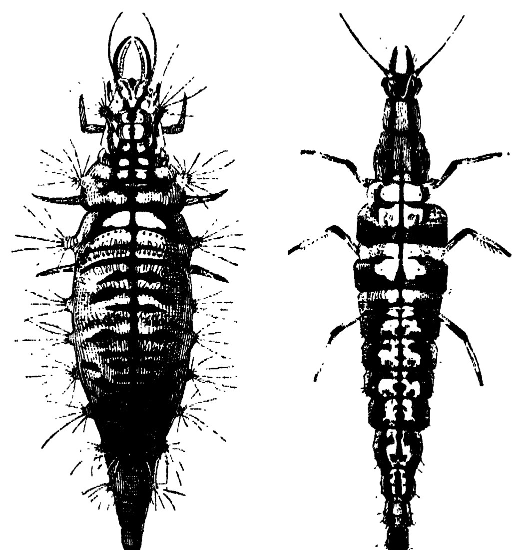
The Brown Lacewing.

The adults of the green lacewings are bright-green in colour and possess two pairs of membranous clear wings, and metallic golden or coppery eyes. Some of these species, on account of their bright eyes are known as "green golden eyes."

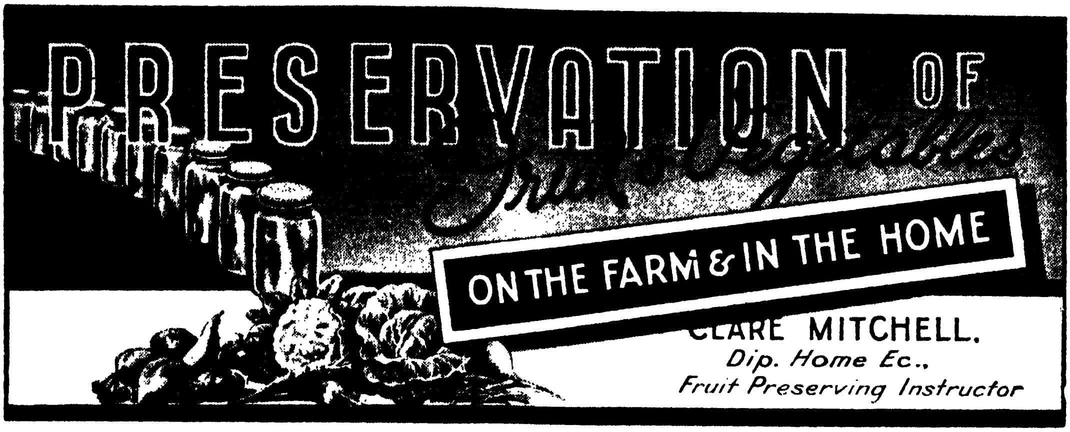
The small white, oval eggs are laid on long slender stalks, in groups attached to the surface of plants or on fence posts and stakes adjacent to their food.

The larvae of the green lacewing are elongate and hairy, and are very active. Many of the species cover their bodies with the remains of their victims—aphids and scale insects on which they have fed, so that sometimes only their elongate mandibles are visible. This is apparently a means of protecting them from their natural enemies. When fully-fed, the larvae spin pearly, spherical cocoons attached to the twigs or branches of trees, and in these they pass their pupal or chrysalis stage. When ready to emerge, the adult usually cuts a small circular opening through the cocoon to make its exit.

The brown lacewings are dull-brown in colour and their wings are somewhat hairy. The eggs are not stalked, and their larvae, which feed on aphids and leaf-hoppers, are elongate and active like those of the green lacewing, but have more slender abdomens and do not cover their bodies with the remains of their victims. The cocoons of the brown lacewings are oval in outline.



Left: Larva of the Green Lacewing.
Right: Larva of the Brown Lacewing.



PRESERVATION OF FRUIT JUICES.

MUCH interest is being taken at the moment in the preservation of fruit juices. This subject was most comprehensively covered from the housewife's angle several years ago in this journal by Mr. E. G. Hall, Fruit Research Officer, and the following is reprinted from his articles.

THE preservation of fruit juices in the home is quite practicable with little more than the usual kitchen equipment, and will enable use to be made of these health-giving beverages during out-of-season periods. Because of their vitamin and mineral content and general alkaline reaction in the body, the daily consumption of fruit juices is being increasingly advocated by medical authorities and nutrition specialists. A 50 per cent. retention of Vitamin C can reasonably be expected in juices preserved in the home by the methods described below, whereas it is almost entirely destroyed when jams and jellies are made. The Vitamin C content will slowly decrease during storage.

Stone Fruits and Berries.

Whereas citrus juices should not be filtered clear, other juices may be prepared as three types, depending on the amount of solid material left in the juice:—

(*a*) Brilliantly clear juice, prepared by clarification and fine filtering—such as most commercial apple and grape juices.

(*b*) Cloudy juice, prepared by ordinary pressing and filtration as by straining through relatively fine cloth—such as cloudy apple, grape and pineapple juices.

(*c*) Pulpy juice, prepared with a screening or macerating device or by coarse straining so as to retain a considerable amount of fine pulp in the juice—such as apricot and tomato juices.

Apart from their attractive appearance, brilliantly clear juices are not desirable, as they have less flavour and less vitamin value than cloudy or pulpy juices. They are also difficult to prepare under home or farm conditions; therefore, home preserved juices should be either cloudy or pulpy.

Fruit syrups, which can be used for flavourings, or for drinks by dilution with four or five parts of water, soda water or milk, can be prepared from fairly acid, highly-coloured and strongly-flavoured fruits such as berries and some varieties of plums, by the addition of ½ to ¾ lb. sugar to each pint of juice after extraction. The addition of sugar helps considerably to preserve flavour and colour and 1 or 2 oz. of sugar to the pint can be added with advantage to nearly all juices.

Selection of the Fruit.

The fruit used should be at the soft, eating-ripe stage, and should be tree ripened for the full development of flavour and colour; if either greener or over-ripe fruit is used the juice will be of poor quality. It must be sound, clean and well washed and all utensils used must also be scrupulously clean to reduce initial contamination of the juice to a minimum.

Apricot, Peach and Nectarine Beverages.

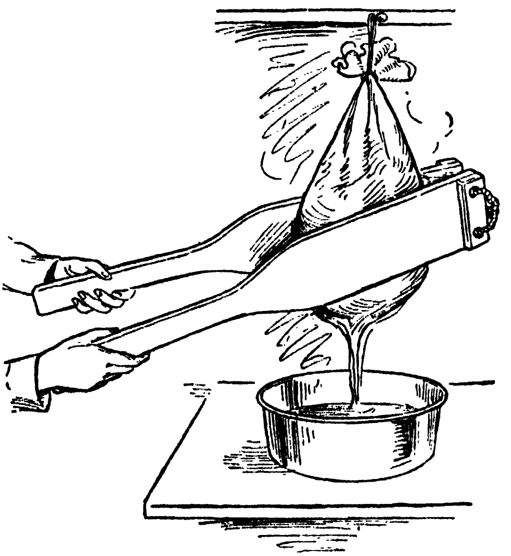
Because of their pulpy nature these are not strictly juices. As the pulp of apricots and yellow peaches, in common with other yellow-fleshed fruits, is rich in carotene, which has a high vitamin A value, the incorporation of a fair amount of pulp in the juice increases the vitamin content and it also improves the flavour of the juice.

The later varieties of apricots, which have better quality, are better for juice than the earlier varieties. Peaches for juice should be yellow-fleshed, highly-flavoured and preferably free-stones. The best variety for juice is J. H. Hale, and Elberta is also good; but the canning types of clingstones are not satisfactory as they are too weak in flavour.

Peach juice is not as good a product as the apricot and nectarine juices, being inclined to be weak in flavour and to develop bitterness; however, it is quite satisfactory if only fully tree-ripened fruits of J. H. Hale or Elberta are used and if the preparation and processing are carried out rapidly. Pulpy apricot juice is an attractive product which blends well with other juices, particularly orange and pineapple. Nectarines make a very good pulpy beverage.

Preparation.

The soft, ripe fruit should first be thoroughly washed. Peaches should then be peeled by steaming for 4 minutes or by holding in boiling water for 2 minutes, after which the skins can be rubbed off; apricots and nectarines do not require peeling. The fruit is then halved, pitted, crushed and placed immediately in an aluminium or enamel pan, containing an inch of water, the pan having been placed on the stove and the water brought to the boil. If a large quantity is being done the fruit should not be crushed but merely quartered and dropped immediately into



Hot-pressing Juice with the Aid of a Nut-cracker Type of Press.

[*After Dearing.*

the pan to minimise waiting before heating, as peaches and nectarines, especially if crushed, quickly turn brown in the air. Rapid heating of the fruit, after cutting, to destroy the enzyme which causes the browning is essential. If there is any delay between peeling and heating, the quartered fruit should be held in cold water or preferably in a weak acidified syrup (2 lb. sugar and 1½ oz. citric acid per gallon). The fruit should be heated to 160 deg. Fahr. and kept at that temperature for 15 minutes, being well stirred to break up the pulp as much as possible. While hot the pulp is pressed through a single thickness of cheese cloth or butter muslin and as much juice as possible strained out by squeezing and working the cloth holding the pulp with the hands. This can also be done by folding the cloth over the pulp after the first juice has stopped running through, holding in the hands and twisting the ends of the cloth in opposite directions. The cloth can also be gathered up in the form of a bag and pressed, as illustrated, between two boards, like large butter pats which are hinged with rope through holes at the wide end, to remove the remaining juice. If the juice is too thick and pulpy it should be mixed with about half its volume of clearer juice obtained by pressing the pulp through a double thickness of cheese cloth.

Sugar is then added to the juice at the rate of ½ lb. to the gallon (2 ounces to the pint); more sugar can be added if desired.

Hot-Fill Processing.

The juice is then put back into the pan, heated rapidly to 170 deg. Fahr. (when steam first appears), with constant stirring to minimise scorching. It can also be heated in a double saucepan with occasional stirring. The hot juice is filled immediately into hot bottles to overflowing. The bottles are then sealed and stood upside down on wooden slats, bags or cloths in a hot water bath at 170 deg. Fahr., in which they are kept for 30 minutes. They are then taken out, cooled away from draughts, which may cause the bottles to crack, and then stored in the coolest dark place available. Cooling should be done as quickly as possible without cracking the bottles and can be done more quickly than in the air by *slowly* running cold water into the vessel and allowing it to overflow, thus *gradually* replacing the hot water with cold.

The bottles are prepared by first thoroughly cleaning and then placing in cold water in the copper or other suitable vessel, with wooden slats or bags on the bottom to protect them from direct heat. The water is brought to the boil and boiling continued for ten minutes. The bottles are taken out and filled immediately with the hot juice.

Plum Juice.

Plums can either be prepared as a pulpy juice, as described above for apricots and peaches, or as a cloudy juice, as described below.

The selection of varieties is important. For a good juice a plum should have a rich colour and flavour and a fair amount of acid. The Diamond plum is good, and Satsuma is satisfactory because of its rich flavour, although red varieties tend to give a brownish-looking juice. Yellow varieties with a rich colour give a more attractive juice, but are often somewhat weak in flavour and acid. The addition of sugar to the juice is more important than with apricots and peaches, as unsweetened juice loses too much flavour and becomes rather bitter; from 1 to 2 lb. of sugar should be added to each gallon of juice.

To prepare a cloudy juice the fruit has to be heated more than for a pulpy juice, in order that it can be readily filtered. The plums should be well washed, crushed and heated with 1 pint of water to 5 lb. fruit to 180 deg. Fahr. (a little hotter than when steam first appears), and held at that temperature for 30 minutes, with intermittent stirring to prevent any burning and to

break up the pulp. The pulp is squeezed through coarse linen, cheese cloth or butter muslin, as outlined for cloudy apricot juice, and then strained through fine linen or several thicknesses of cheese cloth or muslin to remove most of the fine pulp. The juice is then heated to 170 deg. Fahr. and processed at that temperature for 30 minutes by the hot fill method described above.

Sweetened plum juice makes a very good drink diluted with three parts of water to one of juice and served cold. It is much improved by the addition of a small amount of fresh orange juice when serving.

Prune Juice.

The health value of prunes can be obtained in a more attractive form by serving prune juice, which is more correctly an extract of prunes made by extracting dry prunes several times with boiling water.

1st Extraction.—Wash the dry prunes, add 2½ pints of water to each pound of prunes, and simmer with the lid on for 2½ hours, drain and keep the liquid.

2nd Extraction.—Add 1½ pints of water for each original pound and simmer again for 1 hour, drain and keep the liquid.

3rd Extraction.—Add 1 pint of water for each original pound and simmer again for 1 hour, drain and keep the liquid.

Combine the three extracts and add the juice pressed out from the prunes remaining. The juice can be concentrated by boiling, if desired, and is improved by adding lemon juice to taste, and is then hot filled and processed at 170 deg. Fahr. for 30 minutes, as outlined above for apricots.

A good juice can be prepared from fresh prunes by following the procedure given for plums, with the exception that it is not necessary to add more than ½ lb. of sugar per gallon of juice.

The d'Agen variety makes a better juice than the Robe, and small, undergrade prunes can be made use of by turning them into juice.

Berry Juices.

Loganberries, black currants, blackberries, and raspberries make good juices. The fully ripe berries are sorted, washed, crushed and heated to 150 deg. Fahr. in an aluminium or enamel pan with ½ inch of water on the bottom, with stirring to mash the berries, and held at that temperature for 15 minutes. Press immediately, preferably in a rack and cloth press, such as that illustrated; if such a press is not available then the berries could be pressed through coarse linen, or double cheese cloth between two boards, as illustrated.

Then heat rapidly to 190 deg. Fahr. and cool quickly; stand overnight to settle, and in the morning the clear juice can be syphoned off and the bottom liquid filtered through a jelly bag or several thicknesses of butter muslin or cheese cloth, after which the two lots of juice are mixed, 1 lb. or 2 lb. sugar being added to each gallon of juice (black currant will probably need more) and thoroughly dissolved; then heat to 170 deg. Fahr. and process at that temperature for 30 minutes by the hot fill method.

Berry Fruit Syrups.

On account of their rich flavour, strong colour and acid character, berry fruits are most suitable for the preparation of syrups. The procedure is the same as for berry juices except that 4 lb. to 6 lb. sugar is added to each gallon of juice. This greater amount of sugar gives a better retention of colour and flavour. After the sugar has been thoroughly dissolved, the juice should be strained again before processing to remove any fibres which may have been in the sugar and to clear the juice further.

Wire Baskets Available.

WIRE baskets for holding jars of fruit, and which facilitate lifting the bottles in and out of the water bath, are now available. This type of basket was illustrated in the January number of the Gazette.

Preservatives.

If the juices or syrups are required to keep for more than a day after opening, preservative should be added immediately after filtering, by dissolving in a little water and stirring into the juice. It is recommended that 1 grain of sodium benzoate and 2 grains of sodium metabisulphite or potassium metabisulphite be added to each pint of juice.

(To be continued.)

Occurrence of Stickfast Flea in Riverina.

FOLLOWING the detection of stickfast flea (*Echidnophaga gallinacca*) in poultry on a number of properties at Narrandera, Gogeldrie and Griffith, the Narrandera Pastures Protection District has been declared a Quarantine Area vide Stock Diseases Notification No. 256, published in Government Gazette No. 6 of 18th January, 1946.

The movement of poultry, birds, cats, dogs and goats out of the Narrandera Pastures Protection District is strictly controlled and can only legally be made after compliance with the provisions of Regulations 116, 117, and 118 of the Stock Diseases Act, 1923-34. Any movement of such stock is permitted conditional upon the owner or person in charge obtaining a special permit (Form 3) from a Government Veterinary Officer or an Inspector of Stock for such movement.

Approved Seed—March, 1946.

To assist in the production and distribution of approved seed of recommended varieties of crops and vegetables, the Department publishes in this list each month the names and addresses of growers of such seed. For this service a charge of 2s. 6d. is made for each insertion of each variety listed. The number of varieties listed on behalf of each grower will be restricted to twenty-five for the time being. The Department may inspect the crop producing the seed, and in all cases a sample of the seed must be sent to the Department of Agriculture with information as to the location of its production, and must be accompanied by the fee indicated above.

If any seed producer does not wish to pay the advertising charge he may submit his name with the variety of seed and sample to the Department, and if it is approved his name will be listed in the Department and information will be supplied regarding it to inquirers.

Cabbage—

Yates Select Succession, No. 64146—Arthur Yates & Co. Pty. Ltd., 184 Sussex-street, Sydney.

Yates Enkhuizen Glory—A. Yates & Co. Pty. Ltd., 184 Sussex-street, Sydney.

Yates Vanguard—Arthur Yates & Co. Pty. Ltd., 184 Sussex-street, Sydney.

Lettuce—

Imperial 615—Arthur Yates & Co. Pty. Ltd., 184 Sussex-street, Sydney.

Cauliflower—

Shorts—H. Burton Bradley, Sherwood Farm, Moorland.

Yates Phenomenal Early—Arthur Yates & Co. Pty. Ltd., 184 Sussex-street, Sydney.

Yates Phenomenal Five Months—Arthur Yates & Co. Pty. Ltd., 184 Sussex-street, Sydney.

Yates Phenomenal Main Crop—Arthur Yates & Co. Pty. Ltd., 184 Sussex-street, Sydney.

Onions—

Extra Early Flat White—A. Yates & Co. Pty. Ltd., 184 Sussex-street, Sydney.

Hunter River Brown—A. Yates & Co. Pty. Ltd., 184 Sussex-street, Sydney.

Beet—

Yates Derwent Globe (Improved Crimson Globe)—A. Yates & Co. Pty. Ltd., 184 Sussex-street, Sydney.

Yates Early Wonder—A. Yates & Co. Pty. Ltd., 184 Sussex-street, Sydney.

Swede—

Yates Champion Purple Top—A. Yates & Co. Pty. Ltd., 184 Sussex-street, Sydney.

Varieties of Approved Seed Available.

IN order that farmers may be directed to what are regarded by the Department as the most satisfactory local sources of approved seed of recommended commercial varieties of farm crops and vegetables, the Department is willing to supply information concerning such sources of seed of the following varieties:—

Tomatoes—

Rouge de Marmande, Pearson.

The Black Beetle Pest.

(*Continued from page* 124.)

mid-November and Christmas week, varying from district to district and from year to year.

On the other hand, sowing should not be delayed unduly after the old generation has died off, because over-late sowing will subject the young maize to damage by the new generation of beetles which emerges in late summer and early autumn.

There is much evidence to suggest that bare fallowing of the land between August and the middle of March would be of value in killing out beetle infestations. Similarly cultivation of summer row-crops to eliminate summer grass and other grass weeds should do much to prevent the building up of beetle populations in the autumn.

Where black beetle is troublesome, headlands should be kept free of grass and weeds. Large populations of the pest commonly develop in grassy headlands, and these beetles are capable of crawling into adjacent beetle-free land and damaging any susceptible crop growing therein. Once cleared of grass and weeds the headland could be sown down to lucerne or a suitable clover.

THE BREEDING AND FATTENING OF LAMBS
On Irrigation Areas.

K. R. HOWE, Senior Sheep and Wool Instructor.

THE irrigation areas of New South Wales have played a big part in lamb production, and are destined to play an even larger part in the future development of the fat lamb raising industry.

Lamb raising under irrigation conditions is not without its peculiar problems and the purpose of this article is to draw attention to them, where possible, to offer a solution, and at the same time to stress the need for research in various directions.

The irrigation areas of New South Wales fall broadly into two divisions. The Murrumbidgee Irrigation Area may be termed an intensive system of irrigation, *i.e.*, every acre of land to which water can be gravitated, may be irrigated. Irrigation areas such as the Berriquin, Wakool, the proposed Deniboota and Denimein schemes, however, have been and are to be opened up for a much less intensive system of irrigation. The basis of allotment of water in these latter cases is one acre foot of water for every ten acres of the holding These southern schemes are to be regarded as an insurance against drought, rather than as a means of increasing the carrying capacity of the holdings. Fortunately, landholders during the past few extremely dry seasons have been able to purchase excess water when it has been available. In many cases the amount of water utilised has been more than three times the normal water right of the holding.

Whereas, on the Murrumbidgee Irrigation Area sheep were introduced long after the establishment of the area for fruit, rice, dairy products, etc., and take a very secondary position in the gross production; in the southern Riverina, irrigation has been introduced to a well-established fat lamb raising district. It is probable therefore, that in the future, the influence of irrigation on lamb raising will be greater in the southern districts than on the Murrumbidgee Scheme.

Nevertheless, the problems are much the same in either region, but their incidence is multiplied by the degree of intensity of irrigation. Thus one might reasonably expect to find more trouble from disease,

Crossbred Ewes and Lambs Grazing on Irrigated Pasture.

parasites and nutritional disorders on the Murrumbidgee Irrigation Area because of the greater amount of water available to each holding, permitting the production of rich, permanent pastures and in turn, higher carrying capacity.

The Pastures on Irrigation Areas.

Much research and thought have been put into the discovery of pasture species suitable for irrigation. The same might also be said of soil types, and it is possible for the irrigationist to obtain definite information from the Department to guide him in the choice of the most suitable pastures for his holding. It is proposed therefore to discuss them only somewhat generally in this article.

There are two types of irrigation pastures, namely, permanent and annual.

The permanent stands usually consist of a mixture such as perennial rye and/or paspalum and/or *Phalaris* in combination with some perennial clover, *e.g.*, White Dutch. These require a lot of water for maximum production, and are to be recommended on the Murrumbidgee Irrigation Area or in very small areas in the less intensive systems of irrigation in conjunction with annual pastures. Roughly three to four times as much water is required, for maximum returns from permanent pastures as from annual pastures.

Annual pastures such as Subterranean clover and Wimmera rye grass are to be advised where limited quantities of water only are available and to enable the laying down of the maximum area to winter pastures with the greatest economy in the use of water.

These pastures depend on the winter rains to supplement the irrigation water and in normal years satisfactory returns may be obtained from four waterings (two in the autumn and two in the spring), aggregating 1-1½ acre feet per year.

Lucerne requires about the same amount of water as permanent stands, but it will stand up to water shortages much better. The irrigationist must decide himself, how he can best utilise the available water, remembering that he cannot hope to establish the same area of permanent pastures as he would annual pastures. He should be able to provide a small area of permanent pastures (say 20 acres) and lucerne and still allow sufficient water to lay out a fairly large area of Subterranean clover and Wimmera rye grass.

Sufficient water and the proper use of it are most important to ensure maximum returns from irrigated pastures. Careless use of water may result in reed growth and souring of the pastures. Too little water on the other hand restricts the growth and use of the pasture. It is very important to topdress with superphosphate regularly.

The Importance of Fodder Crops.

The irrigation farmer would be well advised not to overlook the importance of fodder crops in considering the best means of utilising his water right. Early-sown oats and barley provide excellent grazing and are very suitable for an early drop of lambs. Further, it takes very little water to ensure the success of a cereal crop for hay or grain. Too many men are prone to gamble on the season despite the availability of water for cereal crops.

Lucerne would more correctly come under the category of fodder crops, though frequently treated as a pasture. A small area of lucerne will provide a surprising amount of hay and with reasonable care in management five tons or better of hay per acre could be conserved. Irrigated lucerne as a grazing proposition leaves much to be desired. Greatest success has been obtained when it is grazed in conjunction with a paddock of dry roughage or supplementary fodders. The writer has actually seen lambs go back in condition on lush lucerne alone. The value of lucerne hay as a fodder, however, cannot be disputed, and as a cash crop the returns from hay are far in excess of returns from sheep grazed.

Summer crops such as Japanese millet, Sudan grass and Amber cane are useful—providing bulky feeds for unexpected contingencies—but it should be remembered that such crops are gross feeders and take a lot out of the soil. Further, they require an enormous amount of water to sustain them.

Fodder Conservation as Drought Insurance.

Irrigation was introduced to the semi-arid regions of the southern Riverina, not with the idea of materially increasing production, but to ensure against drought, and guarantee continuity of production. These

districts, with an average rainfall rising from 14 to 18 inches per year, were able to produce marketable sucker lambs four years out of five. The odd drought year prevented the regular yearly consignments of fat lambs to market. Irrigation was intended to bridge this gap, irrigated pastures, etc., being used as a supplement to existing natural pastures in average to good years and as a standby in adverse seasons.

During the limited time in which water has been available to these districts no less than five out of nine years have been below average as far as rainfall is concerned. Yet regular consignments of lambs have been forwarded to the fat stock markets as compared with greatly restricted activity and in some cases total failure of the fattening of lambs under "dry" conditions on adjacent areas.

First Grade Fat Lambs.

It is questionable whether irrigated pastures alone will carry a flock over a prolonged drought and one should remember that water supplies are not inexhaustable, and also that further distribution of water will be effected each year; so that more calls will be made on the water supplies as time goes on. Irrigationists who were depending on pasture to carry them through 1945 were faced with a grave crisis but for timely rain in June; this, despite the fact that a plentiful supply of water was available during the last irrigation season.

These facts are presented to emphasise the need for fodder conservation, and it is time that this practice received the consideration of every man running sheep, on and off the irrigation areas. Were fodder conservation given its proper place, it should come before the establishment of pastures; yet the stacks of hay and grain silos are still too few and far between.

Sheep breeders should put by, over a period of seasons, sufficient fodder in the form of hay, grain and silage to withstand at least a year's drought. It is contended that the irrigationist has still further obligations to the community in the storing of fodder for sale to sheep raisers in less favoured areas, or districts in which it is impossible to grow fodder.

Hay (lucerne, pasture, wheaten and oaten), grain (wheat and oats) and silage all play a particular part in the feeding of sheep during drought. The use of conserved fodder in the form of supplementary feeding will be referred to later in the article.

Only by conserving fodder in conjunction with irrigated pastures can the irrigationist completely insure against drought. Just as the keen business man establishes a sinking fund against economic contingencies so must the sheep breeder realise the wisdom of building up a sinking fund of fodder.

The Avenues of Production.

The irrigation areas offer numerous avenues of production from sheep—wool or meat or both.

The fattening of store lambs from the less favoured areas not only pays the irrigationist handsomely, but tends to keep store prices at a satisfactory level from the seller's point of view. The profit made by the irrigationist, of course, depends on the margin between the store and the fat price. Were it not for the irrigation areas it is doubtful if store values would firm at a satisfactory level. Much use is made of irrigated pastures in this scheme, particularly during the summer and early autumn and quite a few men prefer it to the breeding of sheep for fattening. Others work this scheme in between lamb drops, but sufficient feed for ensuring lamb drop must be kept in mind.

Sheep are usually bred on irrigation areas for meat or dual purpose production. Dual purpose production means the breeding and maintenance of a flock of sheep possessing a profitable carcase and profitable wool. These flocks usually consist of Corriedales or Corriedale grades. After five generations of breeding back to the Corriedale the flock becomes, virtually, a pure Corriedale. The wether portion and the culls from the ewe portion of each drop are marketed as fat sheep or lambs (according to fattening rate) and the remainder of the ewe drop is retained to build up the flock to a type possessing a shapely carcase and carrying a profitable type of wool. Aged ewes from these flocks make good mothers for fat lamb raising when mated to one of the quick maturing Down breed rams.

There is thus always a ready market for surplus stock, whether as fats or as breeders.

Cross breeding for fat lamb production falls into two broad sections: (1) Breeding from the Merino ewe and British longwool ram for the first cross lamb; (2) breeding from the longwool x Merino halfbred or crossbred ewe and the Down type ram for export lambs.

The Merino ewe is not suited to the confinement of small paddocks so essential to maximum grazing on irrigated pastures or crops; furthermore, it does not show to advantage on intensive irrigation farms.

Where the largest proportion of the holding is non-irrigable, such as the Berriquin and Wakool areas, the Merino ewe may be employed satisfactorily, as it is not then subject to the troubles occasioned by the prolonged damp and semi-swampy conditions associated with permanent irrigation pastures. In these areas the Merino serves a useful purpose in the production of first cross lambs for local or home markets when mated to a British longwool ram. Actually, only a small percentage of these lambs are graded fit for export so that the majority are absorbed by the local lamb trade.

Export lamb raising on irrigation areas is perhaps the most popular line of breeding, particularly in early, quick fattening districts. Every encouragement is given to this type of breeding, for any expansion of the fat lamb industry must be along the lines of an exportable surplus. When considering the possibilities of extending the export season one must realise that this can only be achieved by marketing earlier; back into July and August. In many localities it is quite impossible, due to seasonal peculiarities, to market lambs before October, but on the irrigation areas, particularly the warmer, earlier districts, the early lamb can be produced. Thus, those areas will play an important part in any extension of the export season.

In lamb raising, either for the local or export market, continuity of supply is required. Irrigation areas are in a position to fill in the gaps between peaks of production. The facilities which exist for the control of pasture and crop growth at any time of the year make the mating programme and the lambing period a matter of judicious management. With certain reservations, the lambing may be so regulated as to produce choicest quality lambs at any time of the year. This is a distinct help in any national effort designed to regulate production for local and overseas markets, maintain continuous supply or stabilise price levels.

In the southern Riverina fat lamb breeders are well situated as regards transport facilities and proximity to markets. Located approximately 200 miles by rail from market as compared with almost double the distance in the case of the Murrumbidgee Irrigation Area, these districts have a distinct advantage in respect to minimum loss of body weight and bloom in transit.

(To be continued.)

THE BUFFALO FLY *(Lyperosia exigua).*

A Survey of the Position and a Discussion of Control Measures.*

H. G. BELSCHNER, D.V.Sc., Deputy Chief, Division of Animal Industry.

THE rapidity with which the buffalo fly is advancing south in Queensland gives cause for considerable concern, especially as there appears to be little hope of arresting the advance of the pest.

There may be a limit to how far south the fly will spread, but at present this is not known, and, in spite of work which has been carried out by entomologists, based mainly on the temperature life cycle curve, it would be mere conjecture to suggest the southern boundary of the ultimate distribution of the fly. In 1930 Professor Handschin, an eminent entomologist, visited this country at the invitation of the Council for Scienific and Industrial Research, to make investigations into the buffalo fly problem. He stated in his report that he did not expect the fly would extend much further than Rockhampton. At the present time, the fly is more than 100 miles below Rockhampton and still advancing.

During last summer drought conditions impeded the fly movement to some extent, but it is anticipated that, with normal rain this summer, the fly will move south very rapidly.

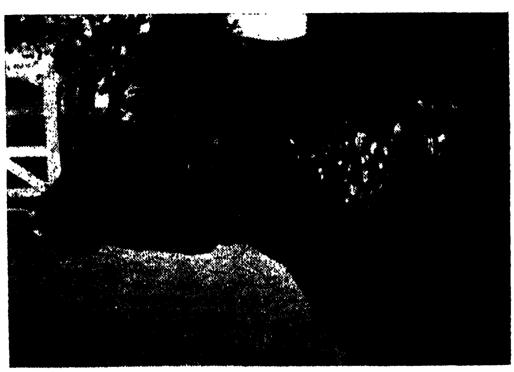
On 23rd October, 1945, the "fly line" ran roughly from Bororen, near the coast (between Gladstone and Maryborough), through Baralaba, in the Dawson Valley, to Springsure. These three places are roughly in the same latitude, that is they are just south of the 20th South parallel of latitude. West of Springsure, the line is indefinite. Indications at that date were that the fly was again becoming active, and it was anticipated that the extension of the affected area would be apparent in the near future.

At the present rate of progress, the fly must comparatively soon enter the North Coast dairying districts of New South Wales and possibly further west from the coast.

To be forewarned is to be forearmed, and whilst there does not appear to be any practical way of arresting the spread of this winged insect, certain notable advances have been made on the control of the buffalo fly by officers of the Council for Scientific and Industrial Research, especially by Mr. K R. Norris, M.Sc., officer-in-charge of buffalo fly investigations at Malanda on the Atherton Tablelands, and also elsewhere in conjunction with the Department of Agriculture and Stock, Queensland.

A general account of the life history and biology of the buffalo fly and a description of the American horn fly trap for the control of the pest was prepared by officers of the Council for Scientific and Industrial Research and Department of Agriculture and Stock, Queensland, and issued recently by the Queensland and New South Wales Departments of Agriculture as a pamphlet entitled "The Buffalo Fly and its Control by the Means of a Trap."

Since then, two further informative circulars entitled "Use of D.D.T. to Control the Buffalo Fly," and "A New Type of Trap for the Control of the Buffalo Fly," respectively, have been issued by the Council for Scientific and Industrial Research. I propose to quote from these circulars, especially the one on D.D.T. during this address.



Buffalo Fly Infested Animal.
Showing typical raw patches on neck and around the eyes.

* An address given to the Tabulam Branch of the Graziers' Association on 8th January, 1946.

Description of the Buffalo Fly.

The buffalo fly is a small, dark-grey fly, about half the size of the common house fly, and somewhat similar to it in general appearance.

The outstanding difference is that the buffalo fly has a sharp, piercing proboscis, whereas the house fly has soft mouth parts adapted for licking and incapable of piercing.

The proboscis of the buffalo fly is especially adapted for blood sucking. The flies live on the blood of the host. When resting on a beast, the buffalo fly holds the wings either folded flatly on top of one another over the hinder parts of the body, or else out from the body, broad arrow fashion.

In bright sunlight the wings are very iridescent and, under these conditions, can be easily detected on an animal. If a wind is blowing, the flies will be found on the sheltered side of the animal, and during rain they move to the lower parts of the beasts.

Primarily a parasite of the buffalo, the domestic animals most seriously affected in Australia are cattle. Horses are also commonly attacked and flies have been seen on pigs, dogs and sheep. Flies have been known to alight on the backs of slaughtermen and other persons working amongst heavily infested stock, but without causing great inconvenience. The flies quickly return to the cattle. Man and animals other than cattle serve only as temporary hosts to the fly, which can survive permanently only in areas inhabitated by cattle or buffaloes, as it breeds in the dung of these animals.

During a visit to North Queensland in 1944, cattle showing grades of infestation from light to heavy were examined. It was noticed that a decided preference was shown by the fly for bulls and stags, and calves were less troubled by the fly than mature stock. Purebred cattle appeared to be more severely attacked than crossbred cattle.

The flies usually congregate in greatest numbers around the withers and shoulders, and on the flanks, but they may be scattered in fair numbers over the neck, ribs and back, and, in small numbers, on other parts of the body and on the legs. On the head the corners of the eyes are common sites.

At Innisfail a moderate to heavy infestation was seen in a mixed mob of dairy and beef cattle put together for inspection. By far the heaviest infestation was on a Devon bull. It was estimated that at least 1,000 flies rose from the animal when it was moved. Steers were also heavily infested, and the cows showed a less severe infestation. The calves were only lightly infested. The reasons for the preference of the fly for certain beasts are not fully understood, but it seems likely that differences in odour may play some part.

Differentiation Between Buffalo Flies and Other Flies Occurring on Cattle.

Stable flies, march flies and bush flies are all larger than the buffalo fly, and the sandfly is much smaller.

There is really only one fly found on cattle with which buffalo fly might be confused and that is a small non-biting fly known as *Hydrotaca australis*. This is a small, dark grey, almost black, fly about the same size as the buffalo fly, but of a more robust build.

Whilst the buffalo fly does not walk any great distance on the hide of the beast, flight being by far the more usual means by which the fly travels from place to place on the host, *Hydrotaca australis* runs around restlessly on the hide. The wings of this species are not so iridescent as those of the buffalo fly when seen in sunlight, and they are also held at a more acute angle to the body. A close examination with a magnifying glass will show that *H. australis* has a soft, retractile sucking proboscis, whilst that of the buffalo fly is erect and stands out from the underside of the head.

H. australis is frequently seen in numbers around sores primarily caused by scratching as a result of buffalo fly irritation. It is also more common on the legs and belly than the buffalo fly.

Life History.

Unlike other blood-sucking flies, such as mosquitoes, march flies and sandflies, which visit cattle only when food is required, the buffalo fly remains on the host throughout the whole of the adult life, leaving the animal only when disturbed or to fly to another animal or for the purpose of laying eggs in bovine dung. The early stages of the life cycle are passed in the dung, the eggs developing into the larva, then to the pupa, and finally the adult fly emerges and immediately seeks the host.

The life cycle may be completed in nine to eleven days in the summer, but may be delayed as long as forty-six days or more in the winter. The length of time the flies live on cattle is not definitely known, and appears to vary a good deal. It is probably from ten to twenty days. Even under favourable conditions the length of life away from the host is about twenty-four hours.

Introduction of the Buffalo Fly to Australia.

The buffalo fly is said to have been introduced to Australia in 1825, when a number of buffaloes were brought from Timor to the Northern Territory. For many years the fly remained confined to the area around Darwin, and it was not until 1912 that the late Dr. Gilruth, then Administrator of the Northern Territory, drew attention to the existence of the fly and suggested that it would become a major pest of cattle.

During the next fifteen years the fly spread rapidly as a result of extensive cattle movements, and by 1927 its area of distribution extended from Broome, in Western Australia, to the western border of Queensland.

It crossed into Queensland below Camooweal in 1928.

During subsequent years, the distribution of the fly in the northern State has fluctuated a good deal, depending upon rainfall and cattle movement. In dry years, the fly receded almost to the border, but the occurrence of wet seasons in 1939 to 1941 resulted in the fly crossing the low rainfall areas bordering the Gult of Carpentaria and continuing its progress towards the east coast of Queensland.

Once the fly reached the coast, it spread rapidly south until it has now reached a point 100 miles south of Rockhampton. In addition to spreading down the coast, the fly also progressed inland from the Mitchell River to the Atherton Tablelands and thence past Charters Towers to Collinsville and, early in 1944 with a wet season, the fly made rapid southerly progress to Clermont and Emerald.

The Further Spread of the Fly.

Now that the fly has reached the closely settled dairying districts of the lower Queensland coast, it can be anticipated that its progress will be accelerated.

Inland, the fly can be anticipated to spread along the Mackenzie River to the Dawson River and on to Miles, Injune and Roma and then to the Darling Downs. By both routes, the fly is rapidly aproaching New South Wales.

Economic Importance of the Buffalo Fly.

The irritation caused by the biting of the flies and the sensation of their presence on the hide is the source of worry to the animals. The actual loss of blood is probably of secondary importance and as far as is known at present, the buffalo fly does not carry any disease.

The cattle toss their heads and switch their tails continuously. They rub themselves against posts and trees and so bring about raw areas on the body which attract other

A Raw Patch has been Rubbed on the Shoulder of this Animal as a Result of Buffalo Fly Infestation.

flies. The increased irritation thus caused results in more rubbing and, if the sore areas are in reach of the tongue they are frequently licked vigorously and the rough tongue of the beast retards rather than assists healing.

When the flies attack the corners of the eyes the cattle scratch with the hind hoofs or rub against posts, thus causing sores around the eyes which are characteristic of buffalo fly infested cattle.

Other situations on which sores commonly occur are the shoulders, neck, dewlap and underneath the beast. Briefly, sores may be seen on all parts of the body not reached by the tail.

Whilst bulls and steers carry more flies than cows, it has been observed that the cows exhibit more raw areas than the other animals.

The Effect of Buffalo Fly Attack on Milk Production and Fattening.

The disturbance to feeding and resting and the energy expended by the animal in its efforts to get rid of the flies and the interference with the grazing of the cattle would be expected to produce some effects on the well-being of stock.

There is no doubt that fly worry does result in a drop in milk production and to some delay in fattening, but many of the reports as to the extent to which this occurs appear to be exaggerated.

Various opinions have been expressed in this connection, varying from 15 to 50 per cent. drop in milk production, and from a few month's to a year's delay in the fattening of beef cattle.

There appears to be as yet no reliable information available on these points and trials are difficult to arrange. Queensland farmers' estimates, on investigation, have been found to be mostly unreliable and misleading.

In connection with beef cattle, factors such as the lateness in the commencement of the fattening season have not been taken into account when the buffalo fly has been blamed for delaying the fattening of cattle.

A former manager of Wave Hill Station stated that he would sooner have the buffalo fly for nine months than sand flies for one month. He said "sandflies scatter the cattle and keep them walking, thus keeping their condition down. Buffalo flies don't scatter the cattle to any extent. They cause sores about the eyes and dewlap and on other parts of the body, but the condition of the station cattle is not severely affected." He went on to say that buffalo fly had been on Wave Hill for many years but was not regarded as a serious station worry. It was a seasonal infestation, more severe in humid weather. Cattle tick infestation was a far greater menace.

In connection with this statement, it is pointed out that Wave Hill Station is open downs country and is unsuitable for buffalo fly propagation. The dung dries out quickly and the cattle are spread over a wide area.

A cattle fattener at Innisfail considered that the buffalo fly delayed the fattening of his cattle by a season. He was unable to supply satisfactory information as to variation in the feed and the effect of cattle tick infestation, which was severe, in delaying the fattening of his cattle.

A dairy farmer on the Atherton Tablelands considered that fly worry had reduced the output from his dairy herd by 50 per cent. From observations made on the farm, including inspection of the pasture and methods of management (no hand feeding in the winter) it is considered that the statement is misleading.

There is some evidence that beef cattle exposed to infestation over a period of years develop a certain degree of tolerance to the buffalo fly.

An additional source of trouble with dairy cattle is the restlessness of infested dairy cows during milking. Horses and working bullocks are difficult to handle when buffalo flies are numerous.

Range of Flight of Buffalo Fly.

As yet no reliable information is available on the range of flight of the fly. Some work has been carried out by the Council for Scientific and Industrial Research on the extent to which flies may travel from one property to another. Difficulty has been experienced in the marking of the liberated flies. Further work is in progress and different methods of marking the flies are being adopted.

Flies found on Palm Island, 20 miles off the coast from Townsville, are believed, after the closest enquiry, to have arrived there on the wing, probably assisted by wind.

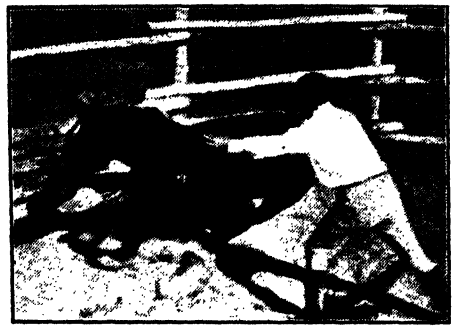
(To be continued.)

He Renders Good Service to Farmers.

MARCH 25th will complete eleven years of service to the "man on the land" by Mr. J. A. Crawcour who now conducts an agricultural radio session for Station 2SM. Throughout the years of his radio work, Mr. Crawcour has co-operated closely with the Department in its educational activities.


MASONITE explodes
Australian
hardwoods

The Breaking, Training and Handling of Horses.



Methods Described and Illustrated.

(*Continued from page 46.*)

T. G. HUNGERFORD, B.V.Sc., H.D.A.

IN the previous sections of this article, which have appeared in several issues since May, 1945, the author has discussed the breaking and handling of horses, giving particular detail of the methods used by McGillivray, given hints on the training of saddle horses, and on the general handling and working of broken horses, and dealt with the general management of horses.

In this and a subsequent issue methods of handling and restraint will be described and illustrated.

Handling and Restraint of Horses.

The Approach.

The horse should be approached from the near side and at the region of the shoulder. With animals in a yard, get the horse alone in one corner and make it face you. Approach steadily, speaking to it. To catch with a halter (in the case of a horse that has been broken), place the loose end of the halter rope up under the neck with left hand, take it with the right hand over the top of the neck and hold firmly the rope-loop so formed, grasping the horse by the nose if it goes to plunge away. Slip the halter over the head with the left hand.

For a horse which may pull back, chock the halter to stop it tightening. (*See* Figs. 24 and 25).

Flapping clothing and sudden movements should be avoided with touchy horses.

If the horse attempts to kick, turn the head to the side being handled, as this upsets the balance.

Fig. 29.—A Twitch of the Type Most Commonly Used.

Fig. 30.—A Halter Twitch.
[Note.—In the illustration the shank of the halter is held from the off side merely to avoid obstructing the photographer's view.]

Fig. 31.—A Fore Limb Held Up.

Fig. 32.—A Fore Limb Tied Up.

METHODS OF CONTROL.

The twitch is a loop of soft leather in a handle, which may be long or short. The long handle allows the horse to be followed if it rears.

To apply the twitch, the hand is placed through the twitch loop, and the loose skin of the upper lip is grasped The loop is slipped down over this skin and the handle twisted to tighten the loop. (*See* Fig. 29.) The pressure causes pain, and the twitch should be moved to attract the attention of the horse.

Generally a twitch prevents refractoriness, but some stallions become frantic and violent with such attempted restraint.

Halter Twitch.

This is another effective twitch; it is illustrated in Fig. 30.

To apply it, run the free end of the halter shank over the head, and then down the other side; lift the upper lip, and place the rope across the gums, then pass back under the shank; pull taut to hurt, and quieten. This is often useful to quieten a young horse when his feet are first handled.

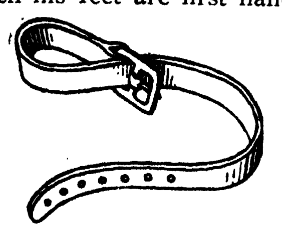


Fig. 33.—Strap Used for Tying-up Front Leg.

Picking-up the Near Fore Foot.

If the horse is a quiet, broken animal, stand against the foot, face the tail, run your left hand down from the shoulder to the fetlock, lean hard against the horse, grasp the fetlock, and lift up the foot; then take the point of the hoof in the right hand. By keeping pressure on the very point and flexing the pastern fully, the power of the horse is nullified. In the case of a touchy or unknown animal, face the animal's shoulder, place one hand on the shoulder joint and bending over grasp the fetlock with the other hand. Should the horse attempt to strike, the hand on the shoulder facilitates the avoidance of trouble.

A method of holding up the front leg more securely than by hand, is to pass a wither rope over the wither with a pad under

Fig. 34.—The Near Hind Leg Held Up Forwards.
The end of the rope is first looped around the off fore leg, then run up over a bag on his wither and through a ring on a strap on the hind leg, as shown.

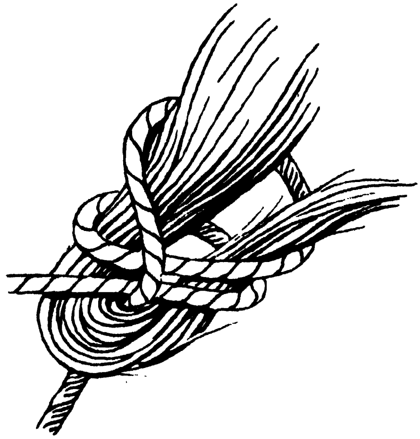


Fig. 35.—Double Sheet Bend for Attaching Rope to Tail.
[After Miller and Robertson.

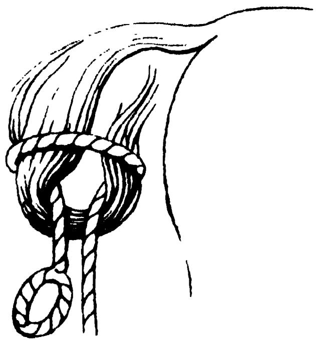


Fig. 36.—Tail Hitch.
[After Miller and Robertson.

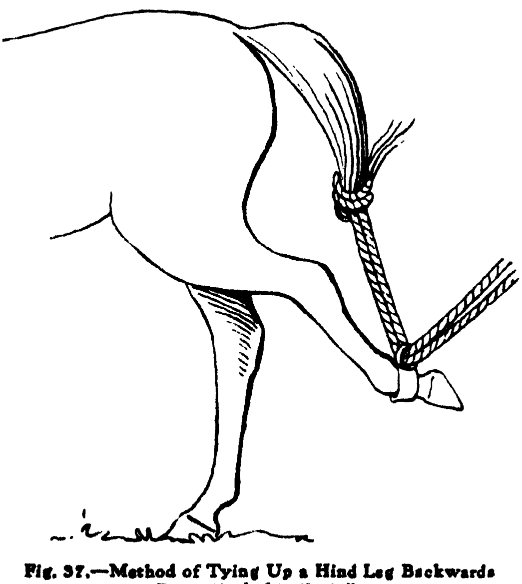


Fig. 37.—Method of Tying Up a Hind Leg Backwards Rope attached to the tail.

Fig. 38.—Another Method of Tying the Hind Leg Backwards to the Tail.

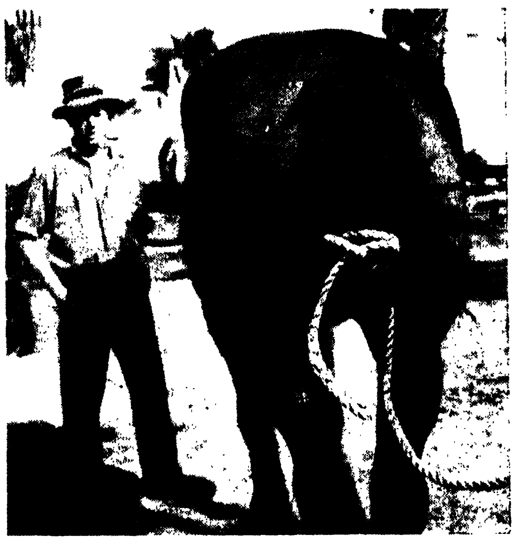


Fig. 39.—A Close up of the Tail-knot used for Attaching the Rope.
See also Fig. 35.

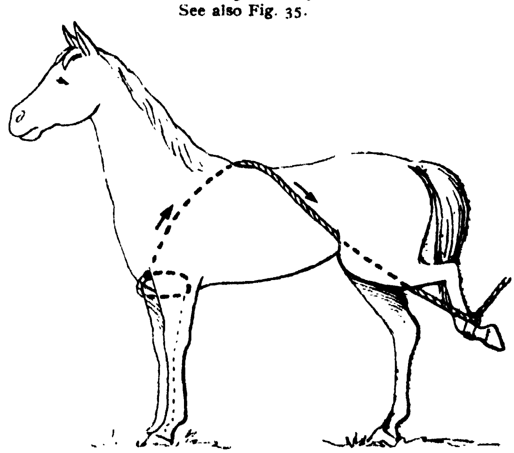


Fig. 40.—A Method of Lifting the Hind Foot Backwards by a Rope over the Back.

it to prevent injury, and to secure this rope around the pastern (*see* Fig. 31). With an attendant pulling on the rope, the fore foot on the other side to that on which the attendant stands, may be held up, no matter how the horse struggles.

Tying-up a Front Leg.

This may be done by passing a stirrup leather or strap fitted with a ring, round the fetlock which is then drawn up and strapped to the forearm. Fractious horses quickly tire of stepping round on three legs. (*see* Figs. 32 and 33).

Particularly violent horses may stumble, or cast themselves, and injure the knee. This can be avoided by securing a pad over the knee.

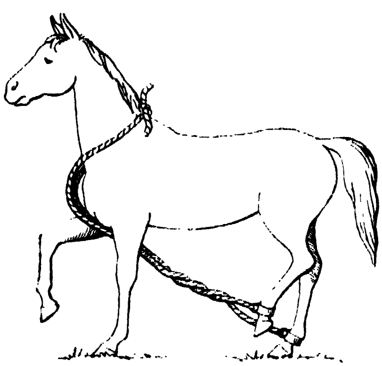
to the body, or nearly so. Wild horses may cast themselves, but should cause no damage.

Another method is as illustrated in Fig. 34.

(*b*) *Backwards*.—To do this a rope is looped on to the tail, either with a double sheep bend (Fig. 35), or with a reef knot hitch (Fig. 36), the rope run through the ring on a hobble strap which is buckled on to the pastern and the hind foot drawn up to the tail (Figs. 37, 38 and 39).

Another method is as illustrated in Fig. 40, using a hobble strap and rope.

All these methods of lifting one foot are very convenient to make a touchy horse stand for some unusual procedure such as clipping, paring the sole (in the case of a punctured injury) and so on.



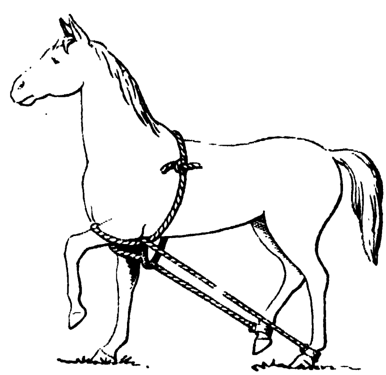


Fig. 41. Service Hobbles.
Convenient for such purposes as vaginal examination, etc.

Picking-up the Near Hind Foot.

Stand at the left flank, facing the tail, and keep the left hand on the point of the hip, ready to push away in the case of trouble. Run the hand down from the croup to the fetlock, grasp this, and draw the leg forward. Grasp the point of the hoof with the right hand, flex it, and grasp the hamstring with the left hand; then bring the hoof on to your left thigh as you step a pace forward towards the horse's tail. If the horse is unknown, make the first lift of the hoof by placing the claws of a hammer under the hoof wall, and draw the foot up with this.

Tying-up a Hind Leg.

(*a*) *Forwards*.—A simple sideline may be placed in position and one leg drawn up

Service Hobbles.

These are convenient when taking the temperature of a touchy horse, or making a vaginal examination, or to protect a stallion during service. Hobble straps may be placed around the hind pastern, or the ends of the ropes may have slip loops which are looped around the pastern (Fig. 41).

The ropes may be—

(*a*) twisted several times and then run between the fore legs and tied over the neck; or

(*b*) each rope may be run inside the forearm, round the outside of same, then under itself and up over the back where it is tied.

(*To be continued.*)

Beekeeping Hints.

THE PREDICTION OF HONEY FLOWS.

D. L. MORISON, B.V.Sc., Veterinary Officer, Apiary Branch.

The prediction of honey flows is of importance to the apiarist both from a management and production viewpoint, for the flora will give the beekeeper some indication as to his likely prospects, and he can plan his operations in the apiary to anticipate honey flows, swarming periods, etc. For the migratory beekeeper the prediction of honey flows presents a special significance, for it is upon such estimates that he bases his moves from one site to another. Since the migratory beekeeper is often involved in considerable amount of expense in making his moves, it is necessary that he should be able to predict honey flows with a reasonable degree of certainty if he is to avoid costly and profitless moves as the result of the failure of anticipated honey flows.

Owing to the increase in migratory work, a greater attempt has been made to find out what factors influence honey flows. There are two main types of flora from which honey is gathered in Australia and the prediction of flows from these two main types relies on two rather different sets of factors. The prediction of honey flows will, therefore, be considered under two main headings, viz.: (*a*) from the Eucalypts; (*b*) from ground flora.

A Difficult Task with Eucalypts.

In some countries the flow of honey from the main producing flora is fairly constant in quantity and occurs during certain set months of the year. However, these conditions do not obtain in Australia. Flows vary considerably in quantity, quality and time of occurrence. The main source of nectar in Australia is derived from the indigenous eucalypts. These eucalypts are notoriously variable in their behaviour from season to season.

Different species of *Eucalyptus* vary considerably in their value as producers of nectar and pollen, both with reference to quantity and quality. Nor does the one species of eucalypt necessarily bloom and yield uniformly every year. Some, for example the Forest Red Gum (*Eucalyptus tereticornis*) blossom almost every year, whereas others, such as Red Stringybark (*Eucalyptus macrorrhyncha*) may come into full bloom once in two or three years. This variation

of the individual species from season to season is one of the factors which renders the prediction of honey flows from the eucalypt species rather difficult.

Factors which Influence Eucalypt Honey Flows.

The following factors must be considered when attempting to predict a honey flow from the eucalypts:—

1. *The Amount of Bud Carried.*—This is the most common guide used when attempting to predict a flow. Many eucalypts bud well in advance of the blooming period, whereas others may hold their buds only a few weeks before flowering. For example the Spotted Gum (*Eucalyptus maculata*) buds as much as twenty months in advance of its flowering period, while the Bloodwood buds two months or so before blooming commences.

If a beekeeper observes a good show of bud on a eucalypt which is known to be a good honey producing species, he may move his bees on to it just prior to the known flowering period. On occasions, however, drop bud may occur should there be extremely dry weather or parasitic infestation. It will, therefore, be seen that, although the bud prospect on a eucalypt may give some indication as to its probable yield, it does not guarantee that the yield will be given. On occasions, species which are usually reliable honey yielders will come into full bloom and yet there will be no nectar secretion. Work has recently been carried out in Victoria with a view to determining whether the starch content of the sap-wood is in any way related to the above phenomenon.

2. *Weather Conditions.*—The effect of weather conditions on the honey yield as obtained by bees from an area of flora can be considered under the two main headings—(*a*) the effect on the flora; (*b*) the effect on the bees.

(*a*) For a bounteous flow from the main eucalypts, it has been contended that good soaking rains should be received at a time when they will promote a large amount of new growth and consequent heavy budding. During the blooming period, fine weather should prevail. Some species, such as the Bloodwood, appear to yield best if warm, fine weather is interspersed with showery periods during the blooming period. Occasionally a heavy yield will be obtained from eucalypts after a period of prolonged drought.

If heavy rains are received prior to the blooming of species such as River Red Gum (*Eucalyptus rostrata*), it may run to new growth and yield little or no nectar.

(*b*) To make the best of the honey flow, bees require calm fine days which are long and warm. This enables them to remain on the blossom for a maximum length of time. Extreme cold prevents the bees working a flow at all, even though a copious secretion be available for them to gather.

3. *The Age and Other Characteristics of the Flora.*—Most living things undergo an initial growth and a subsequent reproductive phase in their existence. Some eucalypts bud, blossom and yield nectar when only a few years old and still in the sucker stage, *e.g.* the Bloodwood (*Eucalyptus corymbosa*). Others such as the Grey Ironbark are not significant sources of nectar until they are perhaps twenty years old.

The density of trees on timbered country much affects their physical form and yielding capacity. In a dense stand of timber, trees tend to be tall-growing and perhaps spindly and to straggle. Such trees usually put on little bud and are rather unprofitable from the apiarist's viewpoint. If trees have been thinned or are naturally well spaced they develop well and possess a good "crown" or "head" of growth. Such trees usually bud very heavily when it is their normal budding period, and yield nectar in greater quantity than do members of the same species which exist in a more cramped environment. The thinning of timber to allow of its proper development is of especial importance in inland areas where the rainfall may be somewhat deficient.

4. *Insect Infestation of the Blossom.*—Very often a flow will be in progress or about to commence when the bloom becomes insect-infested. Thrips and the Rutherglen bug sometimes heavily infest bloom causing the flow to "cut out." On occasions great numbers of Bugong moths occurring in plague form will so successfully compete with the bees that the latter may be in a starving condition, even though a heavy flow is on.

Honey Flows from Ground Flora.

This type of flora is of secondary importance from a nectar yielding viewpoint in Australia.

The White Clover (*Trifolium repens*) is a variable yielder amongst the ground flora. It is said to be influenced by both soil and atmospheric conditions. Soil temperature over 60 deg. Fahr. and a high calcium content have been said to promote nectar secretion. Atmospheric conditions—frequent showering weather interspersed with fine periods and a relatively high humidity—appear to favour nectar secretion. Adequate rainfall during the growing period is essential if ground flora is to reach its maximum development and yield accordingly.

No Certainty in Honey Prediction.

From the preceding, it can be concluded that it is impossible to predict honey flows with any degree of certainty. However, a consideration of the above factors will help the apiarist to arrive at the correct conclusion in a maximum percentage of cases.

(*Continued on page* 166.)

FEEDS and FEEDING NOTES.

Contributed by

The Division of Animal Industry

THE NUTRITIONAL REQUIREMENTS OF POULTRY.

Practical Application of Results of Research.

(*Continued from page* 104.)

G. L. McCLYMONT, B.V.Sc., Veterinary Officer.

Rations for Growing, Laying and Breeding Stock.

LAST month the writer dealt with the general principles involved in making up rations for poultry. In this section their application, and the particular points of practical importance in making up rations for growing, laying and breeding stock, are discussed.

Rations for Growing Stock.

Day Old to Six Weeks.—

When hatched, chickens have a fair reserve of food in the yolk sac, so that there is no necessity for food during the first 24-36 hours. It is common practice to feed some particular feed such as rolled oats during the next 48 hours, but there does not appear to be any advantage over putting the chickens straight on to their starting ration.

Nutrients which must be particularly kept in mind in starting rations are:—Protein, calcium, phosphorus, salt, riboflavin, vitamin A and vitamin D.

The requirements for each of these nutrients have been discussed in previous sections of this article since its commencement in March, 1945, issue, and by using the average content figures given in the sections on these nutrients, the adequacy of any particular ration can be roughly estimated.

The actual feeds and percentages of each in a ration will depend on their availability and cost, and whether a high protein ration with maximum growth rates is more economic than a lower protein ration with slower growth rates.

Points of practical importance in making up rations for growing stock are as follows:—

(*a*) Rations for maximum growth rates and highest economy of food utilisation should contain 18-20 per cent. protein. Where protein concentrates are expensive or scarce, rations may contain as low as 14 per cent., but growth is slow and feed economy poor.

(*b*) Butter milk, skim milk, whey powder, liver meal or synthetic riboflavin, with lucerne meal or green feed, can be used to provide riboflavin and so prevent "leg weakness" and "curled toe paralysis."

(*c*) Calcium can be supplied as ground limestone mixed in the mash, or as shell grit; bone meal or dicalcic phosphate can be used to provide extra phosphorus where necessary.

(*d*) Where sunlight and green feed are available, lucerne meal and fish liver oils are not necessary.

(*e*) Where battery brooders are used, a vitamin D oil is necessary; where no green feed or only lucerne meal is provided, vitamin A is necessary as well.

(*f*) All-mash rations are probably the most convenient for chickens. Though per-

haps slightly more expensive than a grain-mash ration owing to the higher cost of grain meals over cracked grain, the actual amount of feed involved is small and there is only one feed mixture.

(*g*) Where mash and cracked or kibbled grain are fed, chickens will eat about two parts of mash to one part of grain. In these cases, the mash must contain a higher percentage of protein than where an all-mash ration is fed. If a 20 per cent. protein ration is to be fed, the mash part of a mash-grain ration will need to contain about 25 per cent. protein. For a 16 per cent. protein ration, the mash must contain 18.5 per cent. protein.

Sample rations for growing stock are given in Table I.

will usually eat about equal parts of grain and mash, so that the mash should contain 17-21 per cent. of protein if maximum growth rates are required.

Rations for Laying Stock.

Nutrients mainly concerned are protein, calcium, salt and Vitamin A. Important points are:—

(*a*) The total ration should supply 14-16 per cent. protein—the same as for growing stock from 12 to 24 weeks.

(*b*) Where a mash-grain ration is used, the mash should contain 17-21 per cent. of protein.

(*c*) Shell grit fed *ad lib* or ground limestone in the mash can be used to provide calcium.

Table I.—Sampe Rations for Growing Stock (Day old-6 weeks).

	Mash for All Mash Ration (High Protein—20 per cent.).	Mash for All Mash Ration (Low Protein—16 per cent.).	Mash for Mash and Grain (High Protein—25 per cent.).	Mash for Mash and Grain (Low Protein—18·5 per cent.).
Ground Grain (wheat, barley, maize, grain, sorghum)...	34½	43½	5	19
*Bran	15	15	20	20
*Pollard	15	15	20	20
Ground oats	10	10	10	15
Meat meal (50 per cent. protein)	7	5	12	8
Buttermilk powder	5	5	8	8
Peanut meal	7	...	12	...
Linseed meal or Coconut meal ...	5	5	10	7
Lucerne meal	5-10 per cent., replacing bran or pollard if green feed short, or fish oils providing vitamin A.		7-15 per cent., replacing bran or pollard if green feed short, or fish oils providing vitamin A.	
Ground limestone	1	1	2	2
Salt	½	½	1	1
Totals	100	100	100	100

* When bran and pollard are cheap and plentiful, they can be used as higher percentages of the mashes.

Six to Twelve Weeks.—

Total protein can be reduced to 16 per cent. at six weeks, or even lower if maximum growth rates are not required. Riboflavin requirements are also much lower. It may be most convenient to reduce the protein and riboflavin content by diluting the starting mash with grain meal or feeding whole grain. In mash-grain rations, whole grain may be substituted for kibbled grain.

Twelve to Twenty-four Weeks.—

Protein should be maintained at 14-16 per cent. From twelve weeks onwards, birds

Sample rations for laying stock are given in Table II.

Whole Grain and High Protein Concentrate Feeding (Free Choice System).

Overseas experiments have shown that the "free choice system" of feeding can be very satisfactory. In this system a mixture of whole grains is provided in one self-feeder, and a high protein mixture (30 to 40 per cent protein) in another self-feeder. Birds are found to adjust the proportions of grain and protein mixture according to

Table II.—Sample Rations for Laying Stock.

Mashes.	Mash-Grain Rations.				All-Mash Rations.			
	*1.	2.	3.	4.	*1.	2.	3.	4.
Crushed wheat, barley, maize or grain sorghum... ...	...	47	40	19	46½	53½	73½	50
Ground oats	...	...	17	...	...	20	...	...
Pollard	60	20	20	30	25	10	10	20
Bran	32	20	10	30	25	10	10	20
Meatmeal (50 per cent. protein)	7	12	6	5	3	6	3	2½
Peanut meal...	...	...	6	...	...	...	3	...
Linseed meal	...	...	...	5	...	...	...	3
Coconut meal	...	...	...	10	...	...	...	4
Salt	1	1	1	1	½	½	½	½
	100	100	100	100	100	100	100	100
Grain	Wheat, barley, maize, grain sorghum or mixtures, or oats as half the mixture.				....			
Green Feed	Lucerne, oats, barley, clover, etc., or 10 per cent. lucerne meal replacing some bran or pollard plus Vitamin A oil or Vitamin A oil alone.				5 per cent. lucerne meal, etc.			
Shell Grit	*Ad lib.* or 6 per cent. ground limestone in the mash.				*Ad lib.* or a 3 per cent. ground limestone in the mash.			

* When bran and pollard are cheap and plentiful these rations are probably the most economic. The mash for the mash-grain ration is perhaps best fed as a wet mash as, because of its bulky nature, it does not make a good dry mash.

the protein content of the mixture and their laying rate. A ration might be as follows:—

Grain Mixture. (Parts by weight.)		*Protein Mixture.** (Parts by weight.)	
Wheat	4	Meatmeal ..	2
Barley	2	Peanut meal ..	2
Grain sorghum	2	Linseed meal ..	1
Oats	1	Coconut meal ..	1

* Approximate protein content, 40 per cent.

The actual mixtures of grain and protein concentrates should depend on the supply position and costs of the various grains and protein concentrates.

In Victorian experiments, the free choice system has been reduced to the simplest possible, whole wheat being given in one self-feeder and straight meatmeal in another. This ration was found to be equal to variations in which the grain was fed in the litter or where mixtures of whole grain were fed instead of straight wheat, and equal to standard wet and dry mash-grain rations.

Preliminary New South Wales experiments indicate that with the wheat-meatmeal free choice system, autumn production may not be as high as that from other rations, and feather picking may be a factor to be considered. However, there is no doubt that the free choice system has big possibilities where cheap grain is available or grain is grown and it is desired to keep purchased feeds to a minimum, and where labour is to be reduced to a minimum.

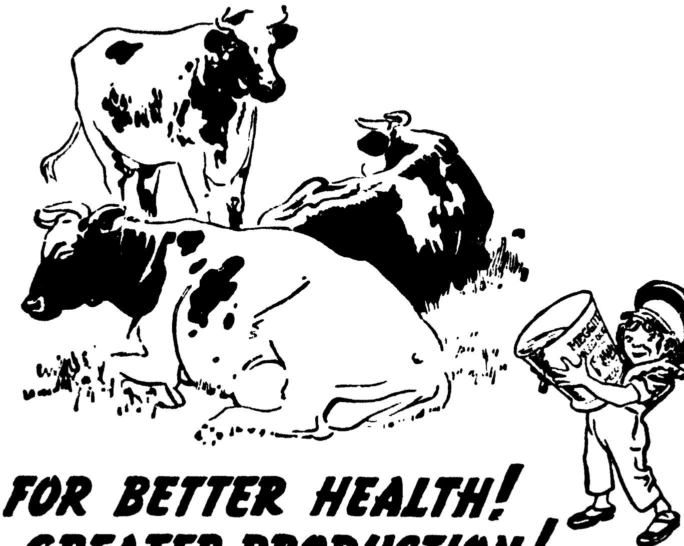
Breeding Stock.

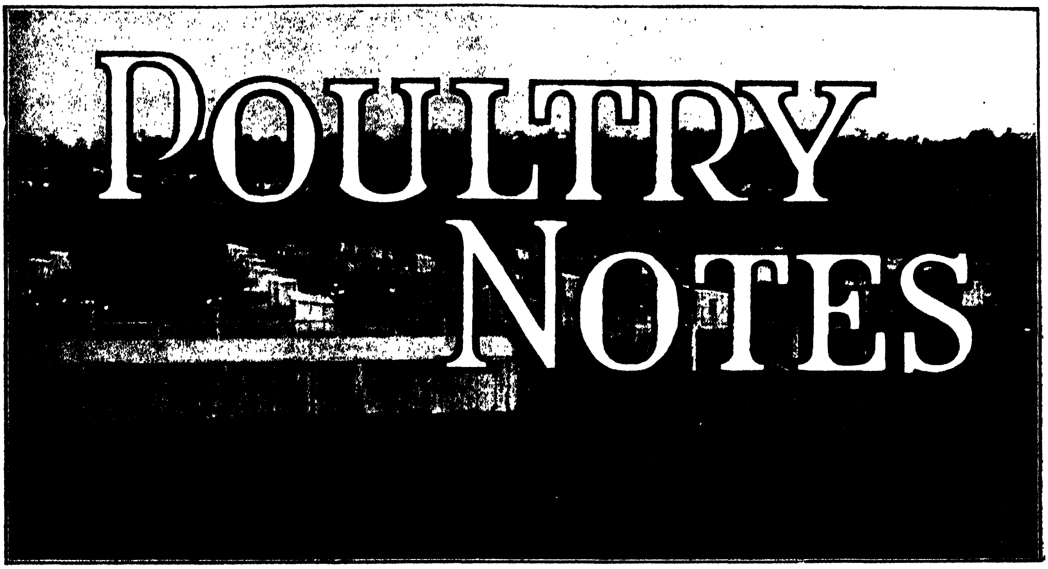
A good laying ration is not necessarily a good breeding ration. Nutrients requiring particular attention in addition to those mentioned under laying stock, are riboflavin and manganese. Important practical points are:—

(*a*) Rations made up with a fair proportion of whole grain or grain meals, even with liberal green feed, are likely to be deficient in riboflavin and manganese.

(*b*) Riboflavin supplements are buttermilk, skim milk or whey powder, liver meal, or synthetic riboflavin. Lucerne meal should be included when green feed is low (see November issue for details),

(*Continued on page 166.*)





Lower Egg Production.

ALTHOUGH production reached record levels during the past flush season, there has been a sharp falling off since the peak was reached in last September, and the latest figures quoted by the Egg Controller show that receivals over the past few months have dropped slightly below the level of last year over the same period, although the progressive total is higher for the year.

The recent reduction in production is due to several factors, the chief of which are the smaller number of pullets raised last spring, the frequent changes in feeding due to the shortage of wheat and the excessive hot spells over the past few months.

In cases where these causes have resulted in a moult amongst the hens, there is little hope of many coming back into production before the end of the autumn and, therefore, those which commenced to moult before the end of February are not worth holding, particularly in view of the reduced amount of wheat available.

As far as moulting pullets are concerned, the position is different, as they will mostly pass through the moult and come back into production in about four to six weeks if not further upset by changes in feeding or general management.

Advice on Culling.

In view of these facts, anyone who has many first- or second-year hens which have definitely commenced to moult should resort to a fairly close culling, unless some of the first-year birds are required for the breeding pens later in the season.

With regard to the pullets, any which are healthy and well developed, whether moulting or not, should be worth retaining. On the other hand, those hatched before the end of September which are unthrifty in appearance and showing no sign of comb development may as well be eliminated at once, as most of them will never be profitable as egg producers.

Planning for Next Season.

OWING to the difficulty experienced by most poultry farmers in obtaining adequate supplies of wheat, inquiries are being received regarding the prospects of being able to obtain sufficient for rearing chickens next season.

Although no assurance can be given that there will be any improvement in the position, it would appear that as the production of mill offals increases, less wheat will be required for gristing into wheatmeal and,

therefore, more wheat should be available for grain feeding.

Raising Chickens on "All Mash."

However, if the production of mill offals continues to increase to the point where there will be adequate supplies for all consumers, it would be possible to raise the chickens up to next harvest on an "all mash," made mainly of pollard and bran with the addition of finely ground oats, meatmeal, bone meal, milk powder, etc.

Thus, although some ground wheat would be desirable to add to an "all mash" or to feed whole for the last feed of the day where dry mash is used, particularly after the chickens reach the age of about three months, there would be no serious effect on the health of the birds if it were omitted.

It would, of course, be necessary to feed the "all mash" in hoppers, and it should be available to the chickens at all times except when closed at night to prevent harbouring rats and mice.

The usual practice in feeding an "all mash" is to make up the mash by finely grinding the grain which is normally given in the afternoon, and adding it to the mash portion of the ration. No whole grain is given in the afternoons, but the "all mash" mixture is fed dry in hoppers.

Recent experiments conducted by the Department indicate that satisfactory results are obtained on an "all mash" ration up to productive age at least.

In view of the foregoing, there does not at the present time appear to be any reason why arrangements should not be made for the rearing of sufficient pullets for normal replacements, and the best course is to go ahead with preparations for the season and make any modifications later, if necessary.

Operations of the Poultry and Egg National Board, U.S.A.

IN the December issue of these "Notes," reference was made to the work of the Poultry and Egg National Board, which has its headquarters at 308 West Washington-street, Chicago, U.S.A.

The Poultry and Egg National Board is the industry's educational and promotional agency. It carries on an intensive nationwide publicity programme to create better markets for poultry products. It has facilities for reaching millions of consumers with facts that will convince them that they should eat more poultry products, because they are essential foods. It has ways and means of getting across to these consumers a persuasive story that will make them want to buy more poultry meat and eggs.

Particulars have now come to hand of the methods adopted by this organisation to bring about increased consumption of eggs and poultry. Included among literature issued by the Board is a circular addressed to producers. In this it is pointed out that the "Board's ability to increase demand depends largely on the farmer's ability to produce and market quality products."

The circular quotes a number of—

"Easy rules that will help to—

*Produce high quality eggs.

*Increase consumer demand.

*Insure greater profits."

Among the main points set out for the guidance of producers in handling eggs are those given below:—

Consumers Want Good Eggs.—Consumers are learning that eggs are a protective food, high in nutritive value, and essential in a good diet. As a result, they are buying more eggs. As the demand increases, housewives are becoming more egg-quality conscious. They are demanding better eggs. It is essential, therefore, that every egg producer takes particular care of the eggs he produces and markets.

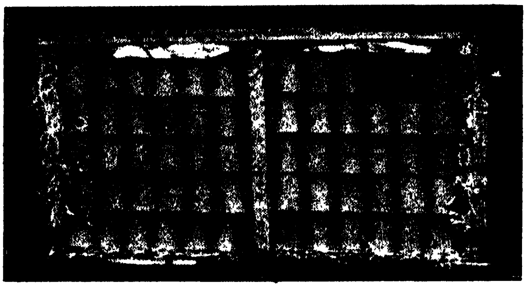
Quality Conservation Starts on the Farm.—The hens do their best to lay high quality eggs. It is up to every poultryman to conserve this quality. The suggestions contained in this folder can be put into practice immediately. They are practical and easy to follow. They will help supply consumers

with good eggs—the kind everyone likes to eat.

Laying Stock is Important.—The laying hen is an important factor in producing top-grade eggs. Select stock which has been bred to produce eggs with these desirable qualities:

(1) Large egg size which is reached soon after maturity.

(2) Good shell texture which persists throughout the year.



Case with Sides Removed to Show Correct Method of Packing.

Note woodwool pads on the bottom and woodwool packing at the ends of fillers to prevent undue movement; also crumpled paper pad on top.

(3) Firm, thick white, which holds up well under handling.

Check these qualities with your hatcheryman because these factors are largely inherited and developed through selective breeding.

Feed a Balanced Ration.—Feed is another important factor in producting high-quality eggs. A good hen deserves good feed. Follow a feeding programme that will insure good shell texture and eggs of high nutritional value. Avoid feeding excessive amounts of green feed. Provide plenty of shell-making material.

Produce Clean Eggs.—Manure and other dirt on the shell of an egg is not attractive to the housewife. She hesitates to put dirty eggs in her refrigerator. Furthermore, this dirt carries bacteria that enter the interior of the egg through the shell pores and cause spoilage. To produce clean eggs, follow these instructions:—

(1) Provide at least one nest for each five hens, to prevent crowding and egg breaking.

(2) Use plenty of clean nesting material.

(3) Do not permit birds to roost in nests at night—dirty nests soil egg shells.

(4) Cover dropping boards or pits with wire to prevent hens from tracking manure into the nests and on the eggs.

(5) Allow at least 3 square feet of floor space for light breeds and 4 square feet for heavy breeds.

(6) Keep litter reasonably clean and dry so that the birds will have clean feet when they go into the nests.

(7) Have clean hands when gathering the eggs.

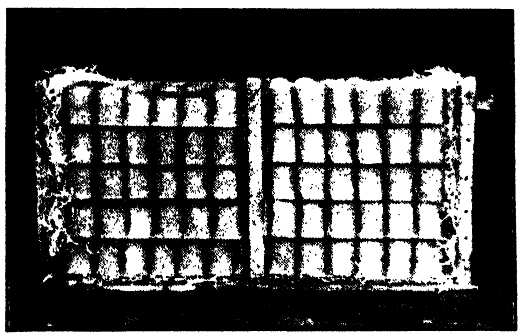
(8) Keep broody hens out of the nests.

Clean the Soiled Eggs.—Dry-clean all soiled eggs before marketing them. Do not put them in water, as eggs absorb both water and bacteria. Fine sandpaper, emery cloth, or steel wool will remove most dirt spots.

Cool Eggs Promptly and Keep Them Cool.—Eggs are a perishable food. They must be kept at a low temperature from the time they are laid until they reach the consumer. To maintain egg quality:

(1) Gather eggs three or four times a day.

(2) Use ventilated baskets or perforated pails.



The Same Case, Showing Correct and Incorrect Ways of Placing Eggs in Fillers.

Left.—Correctly packed—the ends of the eggs do not show above the filler.

Right.—Incorrectly packed—the eggs project above the filler.

(3) Place eggs immediately in coolest place on farm. A clean, well ventilated cellar room, free from odors, is desirable.

(4) Keep the egg room below 60 deg. Fahr. if possible.

(5) Keep the room fairly moist by sprinkling the floor and walls or hanging up clean wet bags.

(6) Do not pack eggs until they are thoroughly cooled. Pre-cool the cases, fillers, and flats.

(7) Use a thermometer to check egg room temperature.

Pack Eggs Carefully.—Eggs properly packed will ship better, will look better, and will sell better.

It pays to:

(1) Pack eggs in standard 15 or 30 dozen egg cases. If second-hand wooden cases are used, be sure they are clean and sound. Renail if necessary.

(2) Use clean, firm fillers and flats.

(3) Pack eggs with small end down.

(4) Place long eggs and very large eggs in the top layer near the centre partition. Nail ½ inch strips at both ends and centre partition to raise cover. Use full covers for tops of cases.

(5) Withhold from market cracked, thin-shelled or badly stained eggs.

Market Eggs Often.—Select the market which offers the greatest incentive to produce the highest quality eggs. Give quality eggs the care they deserve.

(1) Market eggs at least twice a week.

(2) Sell your eggs on the grade . . . . it pays you most for quality.

(3 Protect eggs from extreme temperatures.

(4) Avoid rough handling.

Beekeeping Hints.

(*Continued from page* 159.)

Of course, the use that bees will be able to make of nectar secretion will much depend upon colony strength, which is largely related to pollen supply.

An Item of Current Interest.

During recent months, the main honey flows in New South Wales have been experienced on the South Coast and Highlands from species such as Blackbutt, Snow Gum, Messmate and Yellow Box. These flows have attracted apiarists into areas where American foul brood has occurred in the past. It is, therefore, desirable that beekeepers in these areas should keep in mind the possibility of American foul brood infection, and exercise caution in their choice of location and methods of management. If the apiarist encounters brood which appears to be abnormal, and is uncertain of the condition, he should forward a sample to the Department of Agriculture, Sydney, for examination.

Feeds and Feeding Notes.

(*Continued from page* 162.)

(*c*) Manganese sulphate is the most efficient method of supplying extra manganese (see June and December issues for details).

(*d*) Mashes made up largely of bran and pollard are unlikely to be deficient in manganese, but may, even with green feed, be slightly deficient in riboflavin, so that supplementing high bran and pollard rations with riboflavin supplements is warranted.

(*e*) Where self-fed grain and high protein concentrates are fed to breeding hens, the riboflavin and manganese supplements should be mixed with the high protein concentrate. However, more uniform hatching results could be expected from all mash or mash-grain rations.

(*To be continued.*)

DEPARTMENT OF AGRICULTURE, NEW SOUTH WALES.

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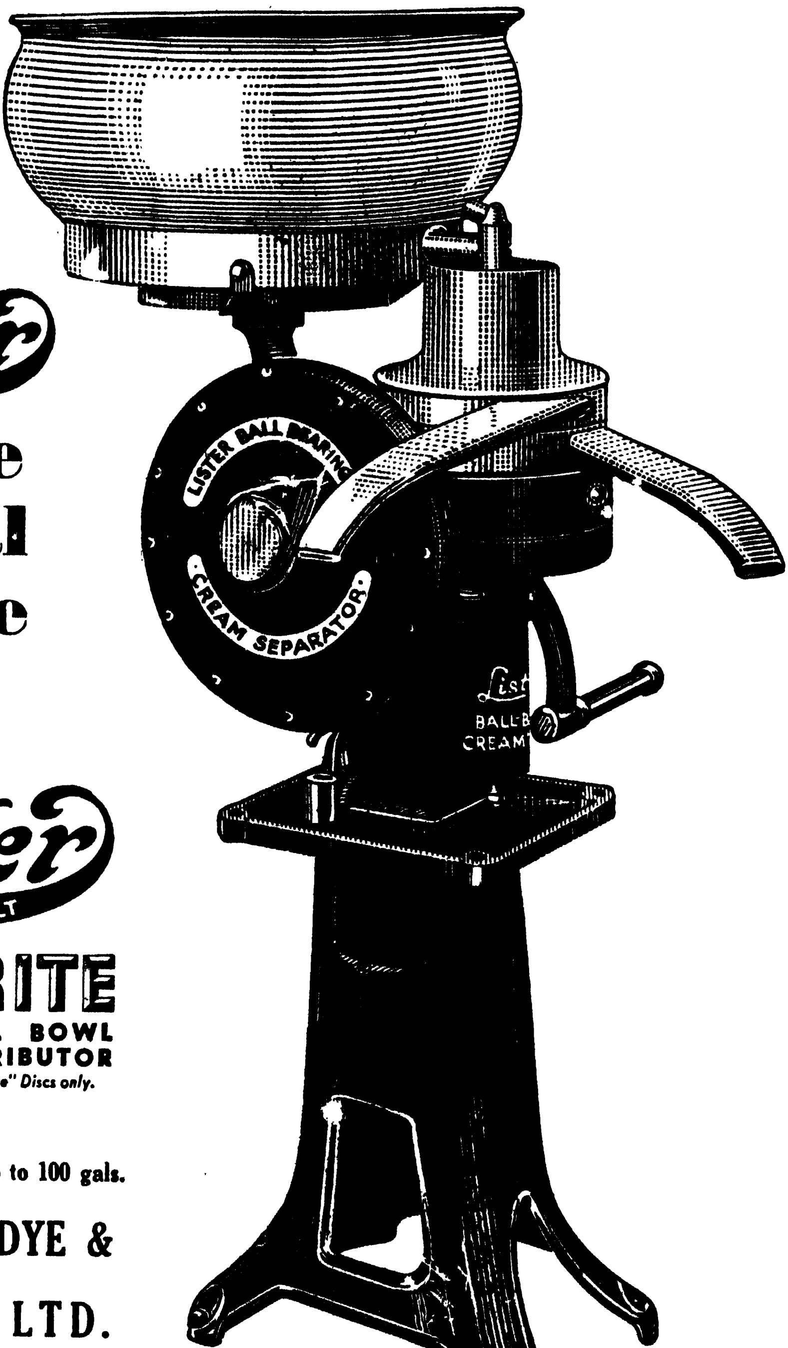

LISTER BALL BEARING
CREAM SEPARATOR

Tubercle-free Herds.

THE following herds have been declared free of tuberculosis in accordance with the requirements of the scheme of certifying herds tubercle-free, and, unless otherwise declared, this certification remains in force until the date shown in respect of each herd :—

Owner and Address.	Number Tested.	Expiry Date.
Registered Stud Herds.		
Bathurst Experiment Farm (Guernseys) ...	28	12/10/46.
Berry Training Farm, Berry (A.I.S.)... ...	129	16/10/46.
H. F. Bradley, "Nardoo," Ashford Road, Inverell (Jerseys)	40	13/4/47.
L. W. Campbell, "Dunmallard," Fern Hill Road, Inverell (Jerseys)	39	21/7/47.
E. J. Cattell, "Kapunda," Rob Roy, Inverell (Jerseys)	121	30/6/47.
E. Chegwidden, "Austral Park," Berry (Jerseys)	88	14/1/47.
Christian Bros., Novitiate, Mt. St. Joseph, Minto	25	11/9/46.
B. N. Coote, Auburn Vale Road, Inverell (Jerseys)	85	23/7/47.
Cowra Experiment Farm (Ayrshires)... ...	53	9/7/46.
Department of Education, Yanco Agricultural High School (Jerseys) ...	66	15/2/46.
R. C. Dixon Elwatan, Castle Hill (Jerseys)	29	5/3/47.
Farm Home for Boys, Mittagong (A.I.S.) ..	31	24/7/46.
Farrer Memorial Agricultural High School, Nemingah (A.I.S.)	44	28/8/47.
N. L. Forster, Abington, Armidale (Aberdeen-Angus)	164	19/5/46.
Forster and Sons, Abington, Armidale (Jerseys)	86	19/5/46.
A. D. Frater, King's Plain Road, Inverell (Guernseys)	107	11/4/47.
W. G. A. & F. J. Frendenstein, "Chippendale," Grenfell Road, Young (Beef Shorthorns)	47	15/1/47.
Grafton Experiment Farm (A.I.S. and Aberdeen Angus)	249	30/7/46.
Hawkesbury Agricultural College, Richmond (Jerseys)	82	19/3/46.
Hurlstone Agricultural High School, Glenfield (Ayrshires)	52	21/7/46.
Kahlua Pastoral Co., "Kahlua," Coolac (Aberdeen Angus)	257	30/11/47.
E. L. Killen, "Pine Park," Mumbil (Beef Shorthorns)	261	25/9/46.
G. Knight, Tannabah, Coonabarrabran ...	60	30/11/46.
Lidcombe State Hospital and Home (Friesian)	111	3/10/46.
Limond Bros., Morisset (Ayrshires)	62	28/1/46.
McGarvie Smith Animal Husbandry Farm, Liverpool (Jerseys)	72	22/2/47.
W. W. Martin, "Narooma," Urana Road, Wagga (Jerseys)	160	11/7/46.
Navua Stud Farm, Grose Wold, via Richmond (Jerseys)	120	8/10/47.
New England Experiment Farm, Glen Innes (Jerseys)	32	6/3/46.
G. H. Newnan, "Bunnigalore," Belanglo (Jerseys)	38	2/12/46.
Peel River Land and Mineral Co., Tamworth (Poll Shorthorns)	110	16/10/46.
C. A. Penney, "Bringa," Dapto (Guernsey and A.I.S.)	97	8/3/46.
W. R. Raper, Calool, Culcairn (Beef Shorthorns)	86	13/2/47.
D. B. Reid, "Evandale," Sutton Forest (Aberdeen-Angus)	61	23/11/47.
Riverina Welfare Farm, Yanco (Jerseys) ...	130	26/6/46.
F. S. Simpson "Gunnawarra," Gulargambone (Beef Shorthorns)	167	19/11/47.
Trangie Experiment Farm, Trangie (Aberdeen-Angus)	148	15/3/46.
Wagga Experiment Farm (Jerseys)	61	10/2/46.
H. F. White, Bald Blair, Guyra (Aberdeen-Angus)	300	20/4/47.
Wollongbar Experiment Farm (Jerseys) ...	97	1/3/46.
Woomargama Estate, Hume (Beef Shorthorns)	206	7/3/46.
A. Young, "Daylesford," Cudal (Beef Shorthorns)	27	3/1/46
Herds Other than Registered Stud Herds.		
114 A.G.H., Kenmore...	70	6/6/46.
Aboriginal Station, Brewarrina	14	20/5/46.
Aboriginal Station, Wallaga Lake	19	29/2/46.
Australian Missionary College, Cooranbong ..	100	30/8/47.
Barnardo Farm School, Mowbray Park ...	45	25/5/46.
Brookfield Afforestation Camp, Mannus ...	203	3/5/46
N. Cameron, Montrose, Armidale (Late New England Girls School)	33	20/2/47.
A. N. De Fraine, Reservoir Hill, Inverell ...	21	8/6/47.
Department of Education, Gosford Farm Home	37	26/2/47.
Ehsman Bros., Inverell	31	22/8/46.
Emu Plains Prison Farm	115	29/1/47.
Fairbridge Farm School, Molong	25	15/4/46.
W. J. Frizelle, Rosenstein Dairy, Inverell ...	134	16/8/47.
Goulburn District Hospital	5	6/11/46.
A. Hannaford, Braidwood	9	1/2/47.
F. C. Harcombe, Hillcrest Farm, Warialda Road, Inverell	53	10/4/47.
F. W. Hunt, Spencers Gully	33	9/2/47.
Koyong School, Moss Vale	2	5/3/46.
J. H. Lott, "Bellevue," Rob Roy, Inverell...	41	26/6/47.
Lunacy Department, Callan Park Mental Hospital	34	21/4/46.
Lunacy Department, Gladesville Mental Hospital	20	15/4/46.
Lunacy Department, Morisset Mental Hospital	79	8/3/47.
Lunacy Department, Parramatta Mental Hospital	62	26/7/47.
Lunacy Department, Rydalmere Mental Hospital	57	30/10/46.
J. O. McGufficke, "Lovely Bank," Rob Roy, Inverell	33	25/6/47.
R. G. P. McLane, Ibis Valley, Swanbrook	36	29/5/46.
S. W. Morris, "Dunreath," Swanbrook Rd., Inverell	43	8/6/46.
J. A. Murray, "The Willows," Keiraville ..	21	8/8/46.
New England University College, Armidale...	10	1/5/47.
Orange Mental Hospital	61	21/2/46.
Parker Bros., Hampton Court Dairy, Inverell	125	25/8/47.
Peat and Milson Islands Mental Hospital ...	25	6/9/46.
G. T. Reid, "Narrengullen" Yass	167	14/7/46.
C. E. D. Richardson, Kayuga Road, Muswellbrook	101	3/7/46.
V. J. Rolfe, "Mount View," Inverell ...	18	9/2/47.
St. John's College, Armidale	11	20/2/47.
St. Michael's Orphanage, Baulkham Hills ...	26	1/6/46.
St. Patrick's Orphanage, Armidale... ...	10	15/11/46.
St. Vincent's Boys' Home, Westmead ...	37	3/7/46.
State Penitentiary, Long Bay	13	30/11/47.
W. J. Stephenson, "Hill View," Fig Tree ...	53	4/2/46.
The Sydney Church of England Grammar School, Moss Vale	48	18/12/47.
J. M. Turnbull, "Pastime," Kayuga Road, Muswellbrook	85	20/3/47.
A. B. Weidman, No. 2 Dairy, Aberdeen Road, Muswellbrook	68	3/9/46.
A. B. Weidman, No. 3 Dairy, Kayuga Rd., Muswellbrook	38	6/9/46.
A. B. Weidman, No. 4 Dairy, Kayuga Rd., Muswellbrook	57	2/11/46.
T. J. Wilks, "Oaks Farm," Muswellbrook ...	27	27/6/46.
A. G. Wilson, "Blytheswood," Exeter ...	57	6/6/46.
C. Wilton, Bligh Street, Muswellbrook ...	54	12/5/46.
Youth Welfare Association of Australia ...	142	19/3/46.

Tubercle-free Areas.

The following Areas have been declared tubercle-free and no cattle are allowed to be kept therein unless subjected to the tuberculin test and found free from tuberculosis :—

Bombala Area.
Inverell Area.
Braidwood Area.
Municipality of Muswellbrook.
Municipality of Queanbeyan.

MAX HENRY, Chief of Division of Animal Industry.

Brucellosis-free Herd Scheme (Swine).

THE following is a list of the names and addresses of owners of herds which have been declared brucellosis-free in accordance with the requirements of the Brucellosis-free Herd Scheme (Swine). The work in connection with this scheme has been undertaken as part of the general campaign against this disease and should perform a valuable service to the industry generally. Owing to the limitations of staff it will not be possible for the Department to undertake the testing of herds in general for this purpose, and in future only herds belonging to Government institutions, registered stud herds, or those containing a preponderance of registered stud animals, will be accepted for inclusion in the list. A charge will be made for the work, since the inclusion of a herd in this list should be of benefit to the owner. After a herd has been accredited, two semi-annual tests will be required, and thereafter annual tests, provided that the conditions outlined in the agreement form are strictly adhered to and that negative results are obtained at each test. So far as the elimination of the disease is concerned, apart from placing the herd on the accredited list, this work will continue as at present.

Registered Stud Herds.

Bathurst Experiment Farm, Bathurst.
Campbell, D., "Hillangrove," Wamberal, via Gosford.
Cocks, F. D., "Condalarra," Goolagong.
Cowra Experiment Farm, Cowra.
Croft, F., Lugwardine, Kentucky.
Draper, R. E., "Glengar," Capertee.
Farrer Memorial Agricultural High School, Nemingha.
Foley, J. B., Gundurimba Road., Loftville, via Lismore.
Garrison Battalion (2nd), Manly.
Gladesville Mental Hospital.
Government Agricultural Training Farm, Scheyville.
Grafton Experiment Farm, Grafton.
Harris, K. H., Pennant Stud Piggery, Purchase Road, West Pennant Hills.
Hawkesbury Agricultural College, Richmond.
Holland, A. L., Argonne, Tubbul.
Hurlstone Agricultural High School, Glenfield.
Maybin, N. C., Towac, Orange.
New England Experiment Farm, Glen Innes.
Newington State Hospital and Home, Newington.
Ricketts, C. C., "Mangus," Young.
Riverina Welfare Farm, Yanco.
Rydalmere Mental Hospital.
Shirley, G. F., "Camelot," Penrith.
Upston, H. E., Wattle Tree Road, Holgate, via Gosford.
Wagga Experiment Farm, Wagga.
White, A. N., Blakeney Stud, Orange.
Williams, G. R. B., "Gwandalan," Grenfell.
Wollongbar Experiment Farm, Wollongbar.
Yanco Agricultural High School.

Herds Other than Registered Stud Herds.

A.G.H. (114 Australia).
Bathurst Gaol, Bathurst.
Brookfield Afforestation Camp, Mannus.
Callan Park Mental Hospital, Callan Park, Rozelle.
Emu Plains Prison Farm.
Glen Innes Prison Camp, Glen Innes.
Gosford Farm Home for Boys, Gosford.
Goulburn Reformatory, Goulburn.
Higgins, J. P., "Koranga," Camden.
Lidcombe State Hospital.
Morisset Mental Hospital, Morisset.
Parramatta Gaol, Parramatta.
Parramatta Mental Hospital.
Peat and Milson Islands Mental Hospital, Hawkesbury River.

Abortion-free Herds.

THE following herds have been declared free of contagious abortion (Bang's disease) in accordance with the requirements of the scheme of certifying herds abortion-free:—

Owner and Address.	Number in herd.
Registered Stud Herds.	
Bathurst Experiment Farm (Guernseys)	28
Cowra Experiment Farm (Ayrshires)	71
Department of Education—Farm Home for Boys, Mittagong (A.I.S.)...	52
Dixson, R. C., "Elwatan," Castle Hill (Jerseys)...	29
Fairbairn & Co., C. P., Woomargama (Beef Shorthorns)	98
Farrer Memorial Agricultural High School, Nemingha (A.I.S.)	44
Forster and Sons, Abington, Armidale (Jerseys) ...	59
Forster, N. L., Abington, Armidale (Aberdeen-Angus) ...	179
Hann, O., Chatsworth Road, St. Marys (Jerseys) ...	14
Hann, O., "Bomerah," Barrington (Jerseys)	42
Hawkesbury Agricultural College, Richmond (Jerseys)...	96
Hill, E. Pritchard, Bowling Alley Pt. (Jerseys)	96
Hurlstone Agricultural High School, Glenfield (Ayrshires)	53
McEachern, H., Tarcutta (Red Poll)	61
McSweeney, W. J., "The Rivers," Canowindra (Beef Shorthorns)	76
Martin Bros. "Narooma," Urana-road, Wagga (Jerseys)	160
Navua Stud Farm, Grose Wold, via Richmond (Jerseys)	120
New England Experiment Farm, Glen Innes (Jerseys) ...	32
Peel River Land & Mineral Co., Tamworth (Poll Shorthorns)	86
Simpson, F. S., "Gunnawarra," Gulargambone (Beef Shorthorns)	150
Training Farm, Berry	118
Trangie Experiment Farm, Trangie (Aberdeen-Angus)	148
Wagga Experiment Farm, Wagga (Jerseys)	25
Walker, Jas. R., "Strathdoon," Wolseley Park (Red Polls)	42
White, F. J., and Sons, Bald Blair, Guyra (Aberdeen-Angus)	263
Whitelaw, L. A., "Wendouree," Merriwa (Beef Shorthorns)	79
Wollongbar Experiment Farm (Guernseys) ...	110
Young, A., "Daylesford," Cudal (Polled Beef Shorthorns)	27
Herds Other than Registered Stud Herds.	
A.G.H. (114th Australia)	66
Callan Park Mental Hospital	44
Department of Education—Farm Home for Boys, Gosford	37
Fairbridge Farm School, Molong	89
Morisset Mental Hospital	79
New England University College, Armidale	19
Orange Mental Hospital	61
Parramatta Mental Hospital	30
Peat & Milson Islands Mental Hospital	25
Royal Prince Alfred Hospital, Camperdown: "Yaralla" Herd	94
Rydalmere Mental Hospital, Rydalmere	57
Salway, A. E., Cobargo	87

MAX HENRY, Chief of Division of Animal Industry.

The Agricultural Gazette.
APRIL, 1946.

FOOD
To Win the Peace.

FOOD played a big part in winning the war; food will have to play a major part in winning the peace.

The food famine which threatens the world to-day is perhaps without precedent. It is well-nigh impossible to exaggerate the likely repercussions of famine on world peace and order. Apart altogether from humanitarian motives, countries unaffected by food shortages should, in their own interest and in that of preserving world peace, strive urgently to refill the world's food cupboard. Such action is an insurance against likely further heavy commitments in lives, money and materials.

At the direction of the Minister for Agriculture (Hon. E. H. Graham, M.L.A.) all field officers of the Department of Agriculture were instructed recently to exert every effort to encourage and assist farmers to step-up production, particularly of wheat, but also of butter and milk products, eggs and meats.

The next six months (until the wheat harvest in the northern hemisphere is gathered) will be extremely difficult. World wheat stocks are 320 million bushels short of requirements. It is, therefore, essential and urgent that growers should strive to make record sowings of wheat within the next few months. Sowing conditions are favourable in most areas, there are no restrictions on the areas to be sown, and with an assurance of a payable price growers should be able, with profit to themselves, to help substantially in the fight against famine.

The food shortage in Great Britain is desperate. Her grain supplies will have to be drawn upon so extensively for human consumption that stock feed will have to be reduced drastically. Britain's stock numbers consequently will have to be reduced, resulting in a decrease in the production of her much needed meat, bacon and eggs. It has become necessary, furthermore, for Britain to increase the flour extraction rate from 80 per cent. to 85 per cent., which means a return to the darker bread which was willingly accepted as a wartime necessity, but which it was hoped to discard when peace returned.

Although wheat will not be as freely available in Australia for stock feeding as perhaps desired, this should cause stock feeders little inconvenience if they can be

enticed to make full use of the supplies of bran, pollard and oats now available. Increased flour milling has stepped-up the output of pollard and bran, whilst last year's 8-million bushel harvest has assured an adequate supply of oats.

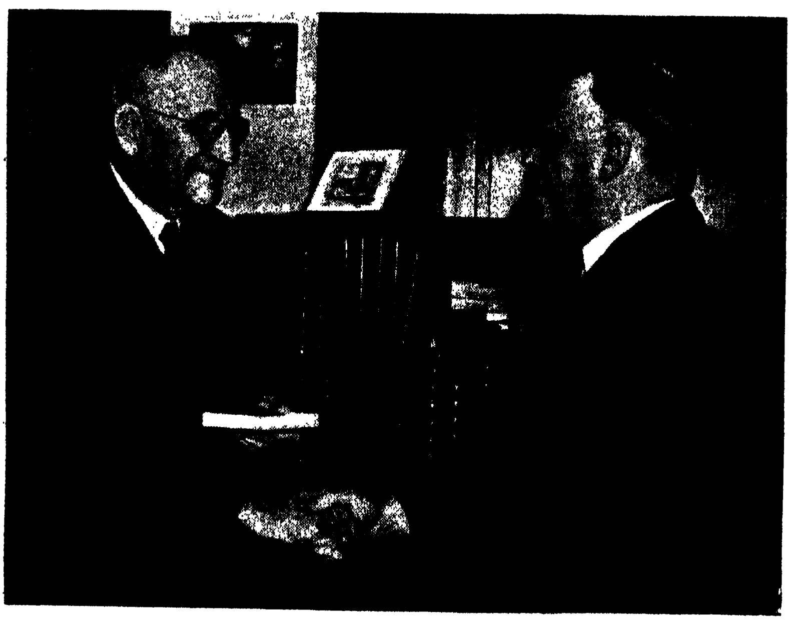
The Department of Agriculture is intent upon removal of obstacles to growers achieving record output in all fields of production. That job has not been made any easier by recent disbandment of War Agricultural Committees, which by their fearless and fair administration of wartime controls, and the lead they gave to co-operative effort, helped producers to achieve records in the face of shortages of almost every aid to farming.

Already much has been done to remove some of the obstacles tending to limit production. Transport of superphosphate threatened to be difficult, but the Railway Department recently gave an assurance which justified the hope that all deliveries will be effected on time. There are still shortages of machinery and spare parts, but manufacturers are exerting themselves to meet essential requirements. In spite of all that has been done, and will continue to be done, some obstacles will still remain. Farmers should, therefore, be prepared to pool their resources in the same co-operative spirit which stood them in such good stead during the war years.

Retirement of Mr. A. H. E. McDonald, Chief, Division of Plant Industry.

MR. A. H. E. MCDONALD has retired from the position of Chief of the Division of Plant Industry of the Department of Agriculture. Making a presentation on behalf of officers of the Department at a farewell gathering, the Minister for Agriculture (Hon. E. H. Graham, M.L.A.) referred to Mr. McDonald as one of the greatest of Australian agriculturists. He was supported by Dr. R. J. Noble, Under Secretary and Director of the Department who referred particularly to the part Mr. McDonald had played in building up the field staff of the Department.

Mr. A. W. S. Moodie, Chief Instructor of Agriculture has been appointed to succeed Mr. McDonald.



Hon. E. H. Graham, M.L.A., Minister for Agriculture, Making a Presentation to Mr. A. H. E. McDonald at a Farewell Gathering of Officers of the Department.
[*Sydney Morning Herald Photo.*

INTERSTATE market reports, which are now being broadcast in the A.B.C.'s lunch-time "Country Hour," are proving of great benefit to the man on the land. These reports are heard at 12.18 p.m., Eastern Standard Time, over the A.B.C. National Network from Mondays to Fridays.

BENZENE HEXACHLORIDE IN GRASSHOPPER BAITS.

S. L. ALLMAN, M.Sc., B.Sc.Agr., Senior Entomologist.

DURING the past season localised outbreaks of grasshoppers have occurred in the Moss Vale and Moree districts. The Wingless Grasshopper (*Phaulacridium vittatum*) was responsible for damage to cultivated crops in the Moss Vale area, whereas the Australian Plague Locust (*Chortoicetes terminifera*) caused some damage to pastures in localities flooded by the heavy January rains in the Moree district.

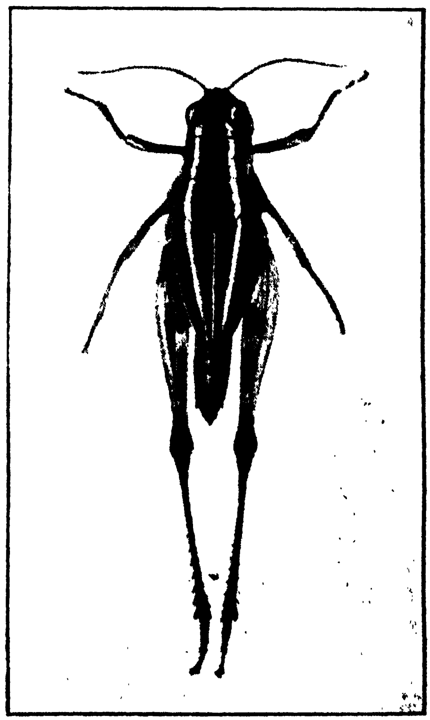
The results of baiting tests indicated that benzene hexachloride ("666")-bran baits were readily eaten by both species; would successfully control mature Wingless Grasshoppers in a crop of cabbages where gross feeding was necessary to cause loss; and would obviously incapacitate a large proportion of a swarm of the Australian Plague Locust within an hour of feeding.

Benzene hexachloride has been used experimentally and in the field against locusts in North Africa and Persia. It has been used mainly as a stomach poison in the place of sodium arsenite or sodium fluosilicate, hitherto the most widely used poisons for this purpose. These latter poisons are incorporated in bran at ½ to 1 lb. per 24 lb., which is approximately 2 to 4 per cent. of the mixture on a dry basis. Benzene hexachloride (10 per cent. gamma isomer) has been available as a 10 per cent. dust with pyrophyllite filler, and has been used at the rate of 0.4 per cent. or 1 lb dust to 24 lb. bran. On this basis, "666" may be regarded as five to ten times more toxic to grasshoppers than sodium arsenite, although considered to be very much less toxic to man and stock.

Preparation and Distribution of Bait.

In preparing the bait the dust is mixed dry with the bran and the water added subsequently. Molasses, if used, can be dissolved in the water prior to mixing with the bran. During the mixing the dust has a tendency to rise, and as "666" has a penetrating and rather nauseating smell, it causes some discomfort to people handling the

Cabbages Destroyed by Wingless Grasshoppers.
[*Sydney Morning Herald* Photo.



The Wingless Grasshopper (Enlarged about 2½ times).

material. This drawback may be overcome by precautions in mixing or by refinements in the manufactured material.

In applying baits it has been the practice to distribute them in the early morning before the 'hoppers commence to feed or in the afternoon after the main heat of the day. However, if a trial handful of bait is broadcast and a few 'hoppers are observed to feed, the distribution can safely proceed, even during the middle of the day. The amount used varies according to the density of the swarm and often approximates 50 lb. (wet weight) per acre.

Dusts.

Although dusts of sodium arsenite, and more recently dinitro-ortho-cresols, have been used overseas, these have not been exploited in Australia. However, with the development of a relatively safe grasshopper poison which could be applied more or less indiscriminately to herbage, this method offers possibilities worth investigating.

Tests with the Wingless Grasshopper.

This Wingless Grasshopper has been causing serious losses to cultivated crops in the Moss Vale district for the past two seasons. Valuable crops such as cabbages, carrots and gladioli have been destroyed in many instances. Blackberries and bracken fern, as well as pastures, have been fed on extensively. One large planting of raspberries in the Robertson area was completely destroyed by the stripping of the canes.

Benzene hexachloride was tested against this species in a crop of cabbages which had been abandoned. At the time of the test the 'hoppers were mainly adult, but owing to their predominantly wingless nature and to the value of the crops involved, trials were carried out.

The baits were prepared on the lines of the standard formula, viz.:—

Sodium arsenite, ½ lb., or 10 per cent. "666" dust, 1 lb.
Molasses, 4 lb.
Bran, 24 lb.
Water, 2½ gallons.

The baits were distributed late in the morning and at a shade temperature of approximating 80 deg. Fahr. 'Hoppers were observed to feed readily enough on the bait.

One plot was dusted with a 2 per cent. "666" dust applied at the rate of 5 lb. per acre. Thus 1/10 lb. of "666" was applied per acre, either in the dust form or as a stomach poison in the bran bait.

In the baited plot, within an hour, numbers of 'hoppers developed tremors and were unable to hop successfully. After 24 hours about 75 per cent. of the 'hoppers were dead and many of those remaining were affected.

The standard sodium arsenite bait was disappointing, and the reduction in numbers negligible, though some dead 'hoppers could be found. A second baiting using double the amount of sodium arsenite did not give appreciably better results.

The 2 per cent. "666" dust, as applied, was quite ineffective but the amount per acre used was small and further tests are desirable.

Little baiting has been carried out against the Wingless Grasshopper, and it is not known whether the failure of the sodium arsenite bait was due to some peculiarity of the species or to the fact that many of the hoppers were mature and mating. Alternatively, the possibility exists that the "666" is actually attractive to grasshoppers.

The results obtained indicated that "666"-bran baits would successfully control mature *Phaulacridium vittatum* in crops where gross feeding was necessary to cause losses, *e.g.*, in matured cabbages, whereas the standard sodium arsenite bait was comparatively useless. In such crops as newly-planted cabbages, carrots or gladioli, where limited feeding would cause heavy losses, belated control measures cannot be expected to prove very satisfactory.

Tests with the Australian Plague Locust.

In March of this year reports were received that swarms of the Australian Plague Locust were present in the Moree district. It was found that hatching had taken place in some areas which were subject to recent floodings. At the time of the inspections a number of swarms were observed—consisting of well-grown 'hoppers with an appreciable percentage of newly-developed fliers. In the course of the next few days

(*Continued on page 182.*)

THE BREEDING AND FATTENING OF LAMBS

On Irrigation Areas.

K. R. HOWE, Senior Sheep and Wool Instructor.

(*Continued from page 148.*)

THE problems involved in the production of fat lambs on irrigated areas of New South Wales—both where intensive irrigation methods are adopted and also where irrigation is an insurance against drought rather than a means of increasing carrying capacity—differ only in degree. They are the subject of this article.

In last issue the author dealt with general aspects of this industry, such as the avenues of production and the feed supply. In this continuation he discusses the choice of breeds and some aspects of sheep husbandry.

Selection of Foundation Ewes.

The selection of breeding ewes as regards type will depend on what system of breeding is followed, but several broad principles should be observed in all cases. Breeders should select well-grown, healthy sheep with strong constitutions, and it is advisable to purchase sheep bred as near as possible to the district, or from a district of similar climate.

For foundation ewes for breeding up to the Corriedale grade dual-purpose flock, and also for breeding the first-cross lamb by the British Longwool sire, straight lines of large-framed, plain-bodied, station- or western-bred Merino ewes should be selected. Size of frame is particularly important.

Ewes for use as breeding stock for export lamb raising should be the half-bred Longwool x Merino type. There are a number of types which answer to the description of crossbred, the most popular being the Romney Marsh x Merino, the Border Leicester x Merino, the English Leicester x Merino, the Corriedale x Merino, stated in order of merit. Selection is usually limited to those crosses available close to the district.

The Romney Marsh x Merino halfbred is regarded as the ideal mother for fat lambs, having the desired size, shape, high lambing percentages, copious milk supply and fairly early maturity. The chief difficulty with this cross is to get the ewes to lamb early,

Good Type Crossbred Ewes.

as a big proportion of them are produced in the later, cooler districts. It should be possible to produce this cross in the Western districts and supply a ready demand for early mating, early lambing halfbred ewes. When selecting this cross the breeder should endeavour to purchase a line bred in the warmer districts.

The Border Leicester x Merino ewe lacks the conformation of the Romney cross, but according to popular opinion produces mate earlier than the general run of crossbreds.

The halfbred or crossbred ewe generally, is considered the most suitable mother for fat lambs in any recognised fat lamb district. It is particularly suitable for irrigation conditions, as it readily becomes accustomed to small paddocks, damp conditions underfoot and rotational grazing—altogether living more contentedly and consequently being more productive than other types.

The Dorset Horn for Early Maturity.

higher lambing percentages and earlier maturing lambs. Whilst they have not quite the copious milk supply of the Romney Marsh x Merino these ewes are capable of mating and lambing earlier. It is easier to secure a line of western-bred Border Leicester x Merino ewes by reason of the fact that they are more numerous and stand up to those conditions.

The English Leicester x Merino is a good type and generally very uniform, indicative of a uniform drop of lambs. The Corriedale x Merino is virtually a comeback and as such carries a finer fleece and lacks the size and shape of carcase of the other crosses. It is slower maturing, but gives satisfactory results when mated to a quick maturing ram such as the Dorset Horn. From present observations on the incidence of "Yellows" (toxaemic jaundice), it appears that this finer woolled type is less susceptible. Perhaps this point is worthy of note when acquiring replacement stock in toxaemic jaundice areas. This cross will

Provided the ewe conforms to the type required, that is, is large-framed, roomy, with a well-sprung barrel, early maturing and capable of producing a high percentage of lambs and a copious milk supply (in short is a good mother)—the choice of a particular cross is not so important. It will generally be restricted to available lines close to the district.

Choice of Sires.

Here again the breed to be selected depends upon the line of breeding. Irrespective of the breed of ram decided upon as a sire, would-be purchasers should accept only those rams bred in a registered stud. The registration of a stud may be regarded as a "hall mark" of quality and purity, and this should be the first consideration when selecting sires. The quality of the lamb depends largely on the quality of the parents. The extra cost of the better quality sire is more than made up by the additional quality and market value of the lambs.

When mating Merino ewes with the British longwool rams for first cross lambs, the Border Leicester ram has been the most popular, particularly in the west and outer agricultural belt. The Romney Marsh has not been used extensively in these districts. The English Leicester ram is favoured by many in the southern Riverina.

When making a selection of any of these breeds the purchaser should not overlook carcase value in order to secure rams with typical fleeces. This does not mean he should disregard quality in the fleece, but, when selecting a sire for lamb production, size and shape of carcase are of paramount importance.

The sire for the second cross or export lamb bred from the halfbred ewe should be chosen from one of the proven Down breeds.

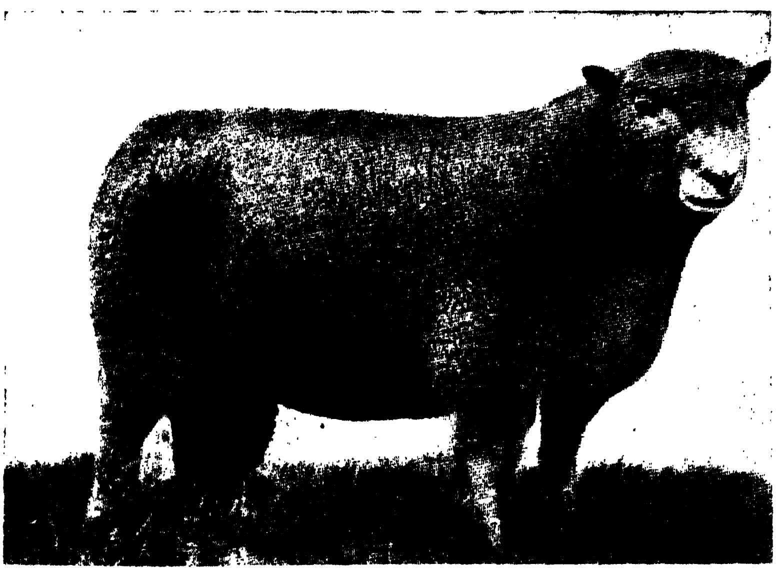
Every effort should be made to reduce the number of breeds to a minimum in order to reach some degree of standardisation of export lamb type. There are altogether too many breeds in use at the present time for the good of the export lamb trade. The two outstanding Down breeds which have proved satisfactory on irrigation farms are the Southdown and the Dorset Horn.

Lambs sired by rams of these breeds have been and are still under observation. As a result of this the following recommendations are made: Where the locality is suitable, such as along the Murray, the Southdown will give excellent results, breeding a more shapely, lower-set lamb—but only where the best types of ewes have been joined. The Dorset Horn does well in the warmer parts and particularly on the finer-woolled, slower-maturing types of ewes. This ram is a vigorous sire and possesses remarkably early-maturing qualities. As a breed it is improving rapidly and irrigation lamb breeders are much impressed with the results obtained from the use of the Dorset Horn. It tends to breed a rather heavier lamb than the Southdown.

When selecting rams of either breed the purchaser should pay strict attention to conformation. The rams must have that low-set, compact, well and evenly fleshed conformation if their progeny are to be expected to come up to export standards.

Irrigation Sheep Husbandry.

The practice of efficient sheep husbandry is just as important as the care exercised in the selection of breeding stock.



The Southdown for the Ideal Carcase.

Nutrition.

The provision of adequate nutritious feed and water is of primary importance in any fat lamb raising enterprise, and helps greatly to bring out the best of good breeding.

The establishment of permanent and annual pastures, coupled with the growing of

fodder crops and crops for fodder reserves in reasonable proportions to ensure a supply of balanced, nutritious fodder for the ewe and lamb, together with judicious management, is essential if the success of each drop of lambs is to be guaranteed.

Grazing.

With regard to the grazing of irrigated pastures there is plenty of experimental evidence to indicate that subdivision into small paddocks and rotational grazing will prolong the life of the pastures, but, as yet, no research results are available to indicate the method of grazing most beneficial to the sheep.

From a sanitation standpoint it should be fairly obvious that a flock of sheep should not be left too long in a small paddock. Much of the pasture, besides becoming fouled, will be tramped down and wasted. Therefore, the only means of avoiding this is to subdivide paddocks as much as possible (say 10 acres) and graze quickly with comparatively large numbers of sheep so that the bulk of the pasture can be utilised before the stock can cause harm.

Most satisfactory results from fattening sheep have been obtained when the irrigated pastures are rotationally grazed in conjunction with a dry, natural pasture paddock or with access to supplementary fodders. There is need for research along these lines to determine what methods of husbandry give maximum returns from the sheep.

Carrying Capacity.

The carrying capacities of irrigation pastures have been proved to be phenomenally high. Permanent pastures, *e.g.*, paspalum and White clover, well managed, have been known to carry up to 10 sheep or 1½ head of cattle per acre per year.

Subterranean clover and Wimmera Rye grass has been known to carry 8 to 10 sheep per acre for the growing period. This pasture, if not grazed heavily during its early growth, after being allowed to go to seed, will carry 8 sheep per acre for six months from the late spring until early autumn.

When lucerne is used as a grazing proposition it will carry from 6 to 9 sheep per acre per year according to the condition of the stand and the type of soil.

It will readily be realised what high carrying capacities can be developed on irrigation areas in which a 1 in 1 water right is granted, and on what a small acreage a profitable lamb raising enterprise can be built up. Four hundred acres properly developed with pastures is as much as any man can cope with.

At the same time these figures might prove a stumbling block for irrigationists with a water right of 1 in 10, should they endeavour to carry a much higher number of sheep than before irrigation pastures were possible. On an 800 acres farm with a 1 in 10 water right the owner would not be able to lay down more than 80 acres of Subterranean clover and Wimmera Rye grass. In three years with careful management the carrying capacity of this area will rise to 8 sheep per acre for 6 months or 4 sheep per acre per year. Assuming that the carrying capacity of the natural paddocks is 1 sheep to 2 acres the 80 acres of irrigated pastures allows the owner to carry an additional 280 sheep. This brings the overall carrying capacity to 1 sheep to 1.2 acres.

Any effort to increase the carrying capacity by more than 280 head of sheep or the overall carrying capacity by more than 1 sheep to 1.2 acres may lead to serious losses.

The irrigation sheep breeder would be far better advised to be satisfied to carry the existing number of sheep better, and conserve fodder against droughts, than to have his sheep chasing every blade of grass as it shoots out of the soil. This is the only method of sheep husbandry which will guarantee continuous production of lambs during "below-average" seasons.

The fat lamb breeder can always utilise surplus pasture growth in excess of fodder requirements by the fattening of store lambs.

(*To be concluded.*)

PLANT DISEASES

Notes contributed by the Biological Branch . . .

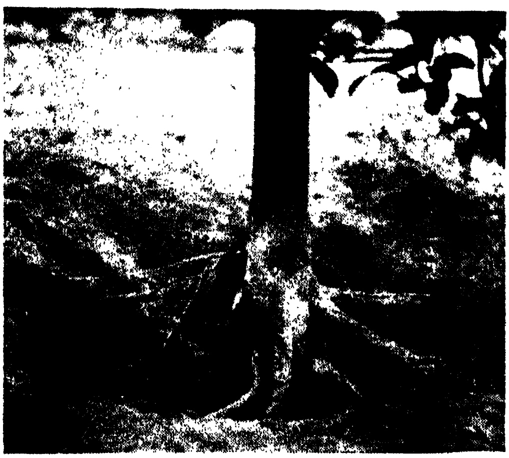
ARMILLARIA CONTROL.

Compressed Air Used for Soil Removal.

ONE of the chief causes of loss to citrus growers in the Somersby, Mangrove Mountain, and Kulnura districts is the root-rot fungus *Armillaria mellia*. This fungus is native to the area, growing on roots of trees such as bloodwood, red gum, stringybark, etc. If any roots or portions of stumps remain after clearing, these may become infected with *Armillaria*, and subsequently the infection will travel to young trees planted nearby. This necessitates the treatment of the affected trees and those near it to minimise the effect of the disease.

A method recently devised at Somersby for the treatment of *Armillaria*-infected citrus trees marks a great advance on current practices.

The only way to maintain an infected tree in production is to remove all the soil from the crown roots to prevent the rot spreading to the main roots and butt, since the *Armillaria* fungus is quickly killed by drying out. Thus treated, and well manured and cared for, an infected tree can be kept in reasonably productive state for years. This process of soil removal has, in the past, been carried out most laboriously by hand, using a small trowel. It is a job which the average grower puts off as long as possible and for which hired labour is difficult to get.

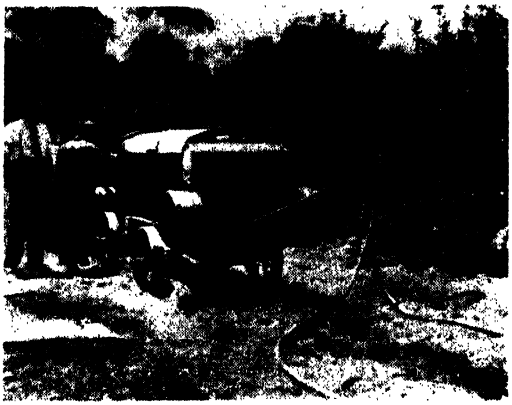


Young Lemon Tree showing Early Symptoms of Attack.
Armillaria may well be established in the root system before any signs are recognisable in the above-ground parts. Note the rotted roots and lesions extending into the crown.

The new method makes use of a jet of compressed air to blow the soil away from butts. The idea of using compressed air for the work originated with Mr. M. W. Hoipo of Somersby, and the credit for the development of the method and its application as a practical proposition is due to Mr. Roy Wood, Fruit Inspector stationed at Gosford. The preliminary trials were made possible by the co-operation of the local D.W.A.C. and the Erina Shire Council, and especially of Mr. Colin Morris, Engineer of the Shire Council.

The Crown Roots of a Young Lemon Tree Exposed by Means of an Air Compressor.
Note that no injury has been caused, even the fibrous roots being intact.

The equipment comprises an air compressor such as is used to operate pneumatic drills, (hired from the Council). The work is carried out at a pressure of about 80 lb. Two hoses 60 feet in length are attached, each with a 6 feet rod equipped with a pistol grip shut-off. The mouth of the rod is directed to the area to be treated and the soil blown away in short blasts. The operator needs a certain amount of practice to enable him to use the air jet to the best possible advantage. The use of the shut-off,



The Air-compressor in Use

wherever possible, to conserve and build up pressure is preferable to using the jet continuously, as it results in much more economical running of the compressor and greatly lowers petrol consumption. The rods at present in use have circular orifices, but Mr. Wood is hopeful that greater efficiency can be achieved by the use of mouthpieces of modified shapes, and is experimenting along these lines.

The machine is pulled into position by the farm tractor, and set up on an even base. The use of the long hoses makes it possible

The speed of the treatment varies with the condition of the soil and the skill of the operators. In dry soil about 150 trees per day can be opened up, or if only enough soil is removed from the butt to allow of examination for infection, as many as 300 per day have been treated. Wet soil, being much heavier, slows down the treatment to about 80 trees per day.

The method is probably applicable only to light soils, but it is only in this class of soils that *Armillaria* is a serious menace.

No definite figure can yet be set down for costs. Hire of the machine and engineer to look after it amount to 30s. per day, and in addition there are the wages of two operators and the cost of the petrol used, which will vary from 6 to 12 gallons per day or more depending on the condition of the soil and the skill of the operators. Allowing for all possible contingencies, costs appear much lower than with the older method, and as experience grows, ways of reducing costs will probably be devised.

The advantages of the new method are obvious. The chief is the speed and the saving of much distasteful and laborious work, and in addition the root system is not

Blowing Soil Away from the Crown Roots of a 7-year-old Lemon Tree at Somersby by Means of a Jet of Compressed Air.

to do about sixteen trees, (or thirty trees planted 24 feet x 12 feet) from the one position.

damaged at all, whereas by the older method small roots were often cut and the bark of the older roots injured.

Squirter and Black-end Diseases of Bananas.

SQUIRTER and black-end rank among the most important diseases affecting bananas. They are market diseases, rather than diseases of the plantation, although the fungi which cause them contaminate the fruit before it leaves the plantation. This contamination occurs mainly during the process of dismembering bunches into "singles." The presence of either disease in a grower's consignment has a depressing effect on the prices realised and prejudices buyers against his brand of fruit.

Squirter disease is a dark, watery rot of the pulp of the fruit, which commences to develop during the ripening process and proceeds further while the fruit is in the retailer's shop and the home of the consumer. The disease is caused by the fungus *Nigrospora sphaerica*. The spores of this fungus are plentiful in many, if not most, plantations, and during packing they may fall from the air on to the broken stem-end of the fruit. The spores germinate and the fungus mycelium grows down the stem of the fruit and invades the pulp, ultimately converting it to a semi-liquid condition.

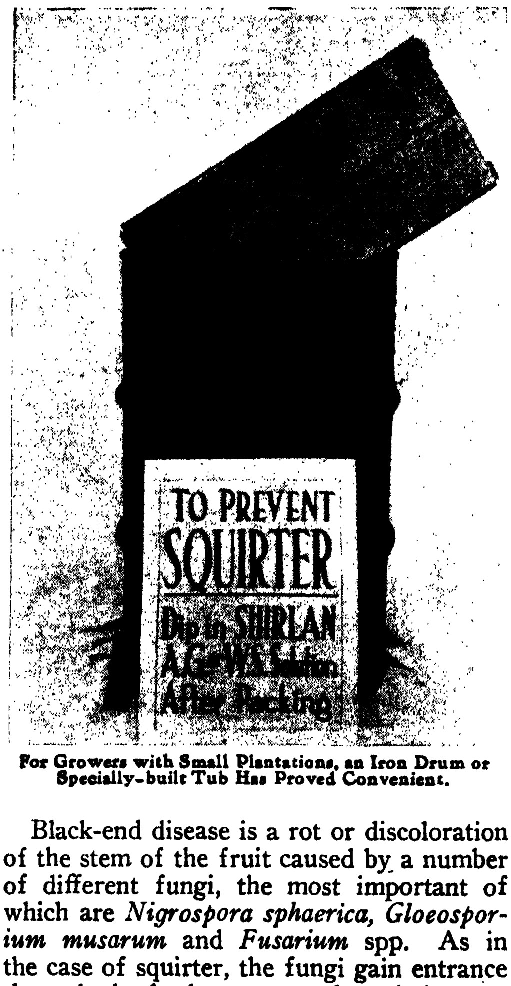
Squirter is most prevalent during the cooler months of the year, but it occasionally occurs in mid-summer. Its winter prevalence is partly accounted for by the fact that the ripening process of fruit is longer during the cooler months of the year, and ripened fruit is held longer in shops and homes, giving the fungus a greater period of activity. Further, fruit that has been chilled, either in the plantation or after packing, is apt to present difficulties in ripening and is very prone to develop squirter during the extended ripening period.

Left.—Section of a Banana affected with Squirter Disease.

Centre.—Fruit from Case Dipped in Shirlan A.G.

Right.—Banana affected with Black-end Disease.

At the time affected fruit is sold, squirter disease may not be sufficiently far advanced to be easily detected, and disagreements between the agent and the retailer or the retailer and the housewife frequently follow. These disagreements usually end in smaller purchases of bananas in favour of other kinds of fruit.



For Growers with Small Plantations, an Iron Drum or Specially-built Tub Has Proved Convenient.

Black-end disease is a rot or discoloration of the stem of the fruit caused by a number of different fungi, the most important of which are *Nigrospora sphaerica, Gloeosporium musarum* and *Fusarium* spp. As in the case of squirter, the fungi gain entrance through the broken stem-end, and the percentage of infected fruit in a consignment is to some extent an indication of the amount of injury the fruit has received during packing.

Fruit from certain classes of soils and from plantations of high altitude is particularly susceptible to black-end. Fruit that has been chilled usually develops a high percentage of black-end during the extended period necessary to ripen chilled fruit.

Control Measures.

Control of squirter and black-end may be obtained by the simple process of dipping the cased fruit in a fungicidal solution after packing. By far the most satisfactory fungicide for this purpose is salicylanilide or its compounds. These may be purchased under the trade names of Shirlan A.G. (25 per cent. suspension of salicylanilide) and Shirlan W.S. (sodium salt of salicylanilide).

Shirlan A.G. should be used at the rate of 1 pint in 30 gallons of water. The fungicide should be well stirred before removing from the tin. Shirlan W.S. should be used at the rate of ½ lb. in 30 gallons of water. The powder should be first stirred to a cream before adding to the water. With Shirlan W.S. a wetting agent (Agral 2 or 3, or Wetsit) should be added. With Shirlan A.G. this is unnecessary as a wetting agent is already incorporated. (A third preparation of salicylanilide, Shirlan flakes, is available, in which sodium salicylanilide is combined with a wetting agent.)

In dipping fruit care should be taken to dislodge airlocks in papered cases by raising and lowering the case a few times. A loop of rope or a pulley block and tackle is helpful in this connection if an upright drum is used as a dipping vat. Suitable dimensions for the tub-like vat are 15 inches deep, 13½ inches wide at the ends, 17½ inches wide in the middle and 32 inches long. A wider vat gives more freedom in handling the case but more solution is required. With the tub-like vat one longitudinal half of a case is treated at a time and very little solution is required.

Time of dipping is a half minute or sufficiently long to wet the surface of the fruit, and the case is then placed diagonally on the rim of the vat to drain. The cost of dipping is small when it is considered that it will eliminate squirter and greatly reduce black-end, thus improving the sales-value of the fruit. The treatment should be a routine procedure from May to November for any grower who has ever had a complaint concerning squirter or black-end in his consignments. This applies particularly to fruit consigned to the Adelaide or Melbourne markets.

CAULIFLOWER SEED CROP PESTS

Field Experiments with the Newer Insecticides.

OBSERVATIONS AND RESULTS.

A. H. FRIEND, B.Sc.Agr., Assistant Entomologist.

THE following note comprises a short diary account of pests found present in a half-acre of cauliflower grown for seed in the 1945 season in the Metropolitan area, together with the results of control measures adopted and of field experiments using the newer insecticides against the Slaty-grey Aphid (*Brevicoryne brassicae*) **and the Rutherglen Bug** (*Nysius vinitor*).

The Four Pests Encountered.

Four major pests were encountered in serious numbers during the 1945 season:

Cabbage Moths (*Plutella maculipennis*), were present throughout the season as adults only, and these were particularly numerous during the seed-bed and early growing phases.

Adults of the Cabbage White Butterfly (*Pieris rapae*) appeared in the seed-bed and during the early growing phases of the crop, disappeared in winter and were next seen in early August.

The Slaty-grey aphid (*Brevicoryne brassicae*) developed on the crop in early spring during flowering which, owing to pollination by bees, and consequent omission of routine spraying, is a critical stage in pest control. In late September this aphid seriously threatened the development of the young seed, and trials were run against it until its natural decline in the heat of late November.

Rutherglen Bug was observed in early spring amongst headland herbage, particularly in the seasons' good growth of trefoil. During late October small numbers of this bug were seen in the crop, and in early November a moderately serious population was evenly distributed throughout the crop. Where no effective control was applied this bug increased to serious proportions and remained so well into the summer.

The Treatments.

Previous *Agricultural Gazette* articles (August to November, 1945), have shown the efficiency of D.D.T. in control of both the Cabbage Moth and the White Butterfly. In the 1945 crop in which these observations were made, seven spray applications, made from a proprietary D.D.T. spraying solution, were used regularly on the whole crop over the four-month period from seed-sowing to curd-maturity. Three sprays diluted to contain 0.05 per cent. W/V. D.D.T. were applied in the seed-bed. The first application in the field was diluted to 0.1 per cent. W/V. D.D.T. and produced minor leaf-burn in spots. The three remaining precurding sprays were diluted to give 0.025 per cent. D.D.T.

At no stage was a caterpillar observed on the plants despite a large population of adults and the deposition of many eggs.

The Grey Aphid Trials.

An application of the same insecticide to give 0.09 per cent. D.D.T. was next sprayed heavily on to the plants when the Grey Aphid (*Brevicoryne brassicae*) was increasing. A poor kill resulted and it was decided to run trials.

The trials included the dusts, 2½ per cent. W/W. nicotine, 2 per cent. W/W. 666, 2 per cent. W/W. D.D.T., 1 per cent. W/W. 666, 1 per cent. W/W. D.D.T., and a mixture containing 0.5 per cent. W/W. of both 666 and D.D.T. A 5 per cent. trade nicotine dust, and experimental samples of highly refined 10 per cent. D.D.T. and 666 dusts were used for dilution with kaolin.

The results were based on an aphid rating method which was performed on two occasions. They indicate that 2½ per cent. nicotine dust, 2 per cent. 666 dust and possibly 1 per cent. 666 dust are most useful for Slaty-grey Aphid control. Although

the rates of dust application are high, it is considered, at least in the case of the nicotine dust, not excessive to give good control against the aphid at this stage of the crop. At present costs the rate of application of 2½ per cent. nicotine dust on an acre of 4000 plants represents an outlay approximately of £15 on the dust—a figure not out of proportion to the value of this type of crop.

For the most rapid knockdown and kill, the 2½ per cent. nicoine dust at 10.5 plants per lb. of dust was best, and gave about eighteen days of freedom before further aphid build-up.

2 per cent. 666 dust at 10 plants per lb. of dust gave the best rating eighteen days after application, indicating considerably greater than eighteen days' protection.

1 per cent. 666 dust at 8.4 plants per lb. of dust showed considerable value for at least four days, and is regarded as better than 1 per cent. or 2 per cent. D.D.T. dusts.

The dust mixture containing 0.5 per cent. 666 and 0.5 per cent. D.D.T. proved no better than 1 per cent. D.D.T. dust.

Rutherglen Bug.

The same dust treatments were used in estimating their efficiency against the Rutherglen Bug. In this case the evaluation of treatments was based upon actual counts of live bugs under the plants. In addition, 0.015 per cent. and 0.25 per cent. W/V. D.D.T. sprays were included and checked against the solvents alone.

Results showed that D.D.T. in dust and spray forms and, to a less extent, 666 (used here in dust form only), are useful against this bug.

The best results were obtained with D.D.T., slightly better counts being obtained for 2 per cent. D.D.T. dust at 8.5 plants per lb., than for 0.25 per cent. W/V. spray at 10 plants per gallon. In either form used D.D.T. rapidly inactivated the bug by contact and quickly cleaned the plants.

The 666 dusts behaved similarly, and although the residual effect was good, D.D.T. was better.

2 per cent. D.D.T. dust at 6.5 plants per lb. gave field protection for at least a month after application, though its effect was slight at five weeks. 1 per cent. D.D.T. dust at 6.5 plants per lb. was effective for about twenty-three days.

2 per cent. 666 dust at 10 plants per lb. gave good protection in the early stages though its residual effect was nil in about a month. 1 per cent. 666 dust at 8.4 plants per lb. gave good protection for about a fortnight, but had completely broken down in eighteen days on the plant.

No advantage over 1 per cent. D.D.T. dust was found for a mixture containing 0.5 per cent. D.D.T. and 0.5 per cent. 666.

Solvent naphtha emulsified in water with a proprietary wetting agent and without D.D.T., but at the same strength as when used for D.D.T. spraying, had negligible value against the Rutherglen Bug.

Benzine Hexachloride in Grasshopper Baits.

(*Continued from page* 172.)

loose swarms of fliers built up and milled round without moving in any definite direction.

A bait consisting of 1 lb. of 10 per cent. "666," 24 lb. bran and 2½ gals. water, was tested against several swarms. Results were quickly evident, some 'hoppers developing tremors within a few minutes and a large proportion was obviously incapacitated within one hour. Results from sodium arsenite baits are frequently not obvious for two or three days, and many growers doubt the efficiency of the bait for this reason.

No direct comparison with the standard sodium arsenite bait was possible in this instance, but it was obvious that the "666" bait was attractive to the Australian Plague Locust. The 'hoppers would cluster about pellets of bait, or would stop and commence feeding when moving on to an area where bait had been distributed.

Molasses was not included in this bait and apparently was unnecessary. However, sodium arsenite-bran baits have also been used successfully without molasses on many occasions.

Seed Wheat and Oats for 1946 Sowing.

List of Growers of Approved Seed.

IT has been decided to publish again this year a list of growers of approved seed wheat and oats who have supplies available for sale. The crops of the growers listed were inspected by officers of the Department and reached a standard of purity and trueness to type up to the approved standard.

Growers listed should notify the Department immediately their available seed of any variety is exhausted.

Wheat.

Bencubbin.—
Carney, C., "Maranoa," Ulamambri.
Ward, H. E., "Gwenvale," Parkes.
Harley, H. J., "Wattle Park," Tullibigeal.

Bordan.—
Dunkley, A. D., "Bon Lea," Brundah, via Grenfell.

Ford.—
Hall Bros., "Ellerslie," Wallendbeen.
Fitzgerald, K., Box 294, Griffith.
Downing, R., "Merton," Dubbo.
Robson, C. C., "Norcia," Rivers Road, Canowindra.
McDonald, H. H., "Belmont," Canowindra.

Gular.—
Byrnes, E., "Glen Ayr," Burdett.

Javelin—
Carr, R. T., "Enfield," West Wyalong.

Rapier.—
Carney, C., "Maranoa," Ulamambri.
Carr, R. T., "Enfield," West Wyalong.
Ward, H. E., "Gwenvale," Parkes.

Oats.

Algerian.—
Wilson, R. & Sons, "Fairview," Oberon.
Dickson, A. S., "Yurunga," Oberon.
Witten, R. A., "Willowbank," Oberon.
Howard, G., "Kallara," Springdale.
Burns, W., Goongirwarrie, Carcoar.

Belar.—
Hall Bros., 'Ellerslie," Wallendbeen.
Hill, A. H., "Carawatha," New Molyan, via Mendooran.
Witten, R. A., "Willowbank," Oberon.
Uther, L. F., "Myonah," Cowra.
Ward, H. E., "Gwenvale," Parkes.
Cullen Bros., Bunglegumbie, via Dubbo.
Idiens, E., "Kangarooby," Gooloogong.

Brigalow.—
Wilson, R. & Sons, "Fairview," Oberon.
Gardiner, A. K., Claremont, King's Plain, Blayney.

Fulghum.—
Crick, P., "Mayfair," Gollan.

Kurrajong.—
Ward, H. E., "Gwenvale," Parkes.

Barley.

Abyssinian.—
Idiens, E., "Kangarooby," Gooloogong.

Approved Seed—April, 1946.

To assist in the production and distribution of approved seed of recommended varieties of crops and vegetables, the Department publishes in this list each month the names and addresses of growers of such seed.

Cauliflower—
Shorts—H. Burton Bradley, Sherwood Farm, Moorland.

Varieties of Approved Seed Available.

IN order that farmers may be directed to what are regarded by the Department as the most satisfactory local sources of approved seed of recommended commercial varieties of farm crops and vegetables, the Department is willing to supply information concerning such sources of seed of the following varieties:—

Tomatoes—
Rouge de Marmande, Pearson, Break O'-Day, Tatura Dwarf Globe.

FRUIT GROWING.

BORON DEFICIENCY IN APPLES

Observations at New England Experiment Farm

(*Concluded from page* 136.)

J. A. HOLBECHE, H.D.A., Fruit Instructor.

THIS concluding instalment of these observations deals with the damage caused to trees by the application of excessive quantities of borax, and with the "measles" condition of Delicious apples; and summarizes the recommendations for the application of borax to apple trees for the control of boron deficiency diseases.

Previous instalments have appeared in January, February and March issues.

—

Damage Caused by Applying Excessive Quantities of Borax to the Soil.

YOUNG TREES.

Tests were carried out, at Glen Innes, for the purpose of observing the effects of applying borax to yearling apple trees.

Boxes containing approximately 1,188 cubic inches of soil, collected from around Granny Smith trees, growing in the Glen Innes orchard, which are known to be suffering severely from boron deficiency, were used. One yearling Granny Smith tree was planted in each box. The trees were worked on various stocks, including Northern Spy strains, Dougherty and Granny Smith seedlings.

Treatments each year commenced in September and continued until early in December. In all cases powdered borax was used; the amount applied each year varied from 1 to 8 oz. in 1938, and from 1/16 oz. to 1 oz. per tree in 1939. A number of trees were left untreated for use as checks. The borax was carefully distributed on top of the soil around each tree and lightly worked in immediately after treatment.

By comparing the quantity of soil used in the boxes with that around the root area of a full-grown tree, some idea of the excessiveness of the application of borax can be formed. The 1/16 oz. to 8 oz. applied to trees in the boxes would represent a field dressing of 8 lb. to 60 lb. of borax to one full-grown tree, which is a ridiculous quantity.

When the 1938 test had been completed, all material was discarded and a fresh start made in 1939.

RESULTS.

In neither test could results be related to the type of stock used.

1938 Tests—Treatments of 1 oz. to 8 oz. of Borax.

Treated 13th September.—When examined on 9th November all trees treated 1 oz. to 4 oz. borax were alive, but their growth was very restricted, and generally wilting and bronzing of the leaves was severe. On 22nd November all trees except one were completely dead; this last tree died on 12th February, 1939.

Treated 13th October.—When examined on 9th November trees treated with 1 and 2 oz. of borax were healthy and growing normally. In the 3 and 4 oz. borax plots, most leaves were wilted and bronzed. When examined on 22nd November, all trees showed wilting and bronzing of the foliage, but no trees were completely dead.

All trees which received 1 to 4 oz. of borax were completely dead when examined on 12th December.

A number of trees received 8 oz. of borax on 13th October and when examined on 9th November all showed severe wilting and bronzing of the leaves; the stems also were discoloured. On the 22nd November all trees were dead.

Treated 13th November.—On 12th December no severe damage was observed; most of the bronzing and wilting of the leaves was found in the 3 oz. and 4 oz. plots.

Trees which received 3 and 4 oz. borax were dead on 28th December, but the trees which received 1 and 2 oz. of borax were not completely dead until 31st January.

Treated 13th December.—All treated trees were dead by 21st February; where applications of 5 to 8 oz. of borax were made, the stems were dark-red.

Each year trees which were not treated with borax showed no discolouration of the foliage, but at the end of the season presented a stunted appearance.

1939 Tests—Treatments of 1/16 oz to 1 oz. of Borax.

Although the amounts of borax applied to trees in 1939 were considerably reduced, much damage to the foliage was observed. However, a number of trees, although slightly affected by the borax, were alive at the end of the season. Most of the surviving trees were found in plots which received 1/16 oz. of borax.

Periods at which Damage was Observed.

November.—No damage observed in the September application plots until 6th November, two months after treatment. The damage at that stage was characterised by the presence of bronze-coloured areas on the edges of the leaves; trees in plots which received ⅝ and 1 oz. of borax were most affected.

December.—Trees treated with 1 oz. of borax in November showed bronzing of the leaves and darkening of the stem.

January.—Trees in plots treated September, October, November and December, showed some effects from the borax.

February.—Many trees treated with 1 oz. borax were completely dead and the stems discoloured.

Although trees treated in September did not show any damage until two months after borax was applied, trees treated in October, November and December showed damage within a few weeks.

Symptoms of Boron Injury on Young Trees.

EFFECTS ON THE LEAVES.

(*a*) *Bronzing.*—Usually the appearance of bronze- to copper-coloured areas on the leaf margin was the first indication of boron damage. In most cases the bronzing condition extended and sometimes covered the whole of the leaf surface. This discolouration was invariably confined to the upper surface of the leaves.

(*b*) *Wilting.*—In some instances leaves on affected trees showed no discolouration, but after a time the whole of the tree commenced to wilt and the leaves soon became dry and brittle.

(*c*) *Yellowing and Distortion.*—Some affected trees showed no bronzing or wilting of the leaves; instead they commenced to yellow at the first sign of boron damage. Later in the season the old leaves became quite yellow and dropped readily. Associated with this yellowing of the leaves was a slight curling condition, which in severe cases caused the leaves almost to meet at the edges.

(*d*) *Leaf Drop.*—Most trees affected with the bronzing or wilting condition held their leaves right through the winter months. Leaves affected with the yellowing condition fell readily.

EFFECTS ON THE STEM.

Without exception all trees which died after treatment with borax showed some stem discolouration. Where the borax applications were heavy the stem colour varied from very light-brown to, in the case of severely affected trees, almost black. In severe cases the discolouration extended right through the bark and wood. In 1939, when smaller amounts of borax were applied, the stem discolouration was not nearly so severe. Generally the stems of affected trees showed an even reddish-brown colour, while some shrivelling was also evident. This browning was, in most cases, confined to the outer layer of bark on the stem.

EFFECTS ON THE ROOT.

All affected trees at the end of the season showed no root development. In none of these trees was it possible to locate any fine hair roots. Generally at the end of the season, affected roots were dark in colour. When severely affected the dead dark areas extended right through the root sections.

Aged Trees.

The damaging effects resulting from the faulty application of borax to the soil has been illustrated in an article published in the *Agricultural Gazette of New South Wales*, August, 1941.

The New England Experiment Farm experiments for the control of cork were planned to yield information concerning the effects of applying heavy amounts of borax to apple trees and trees in various plots received 2, 3 and 4 lb. of borax for one and three years; a number also received 5 lb. per tree for two and three years.

Fig. 12.—Jonathan Apple Tree Damaged by Incorrect Application of Borax.
The borax was applied in contact with a root 3 feet from the butt. The root was killed and the damage has extended up the trunk of the tree.

It is of interest to note that in no case was any evidence of damage to the trees apparent until two years after the borax was applied. Generally the treatments did not cause any visible damage where less than 6 lb. of borax was applied.

The effects of applying excessive amounts of borax to aged trees are summarised under the following headings:—

(*a*) *Foliage and Limbs.*—The foliage on trees which received 6 to 10 lb. of borax over a two-year period was very sparse. The leaves generally varied in colour from light-green to yellow. Often, affected trees became partly defoliated by the middle of January, due to the heavy fall of yellowed leaves.

Except for an isolated instance, no sign of any bronze-coloured areas on the leaves was found. One year a single Jonathan tree which had received 8 lb. of borax showed leaves with distinct bronze-coloured areas on the margins.

Severely affected trees produced no lateral growth and were obviously in a weak condition.

Cleopatra, Delicious, Granny Smith and Jonathan trees, which had received 9 and 10 lb. of borax over a two and three year period, showed damage to the trunk and, in some cases, the limbs were also affected. Where the damage was most severe the dead bark had lifted on the trunk and several limbs were completely dead. (See Fig. 12.)

(*b*) *Roots.*—Two years after treatment a number of Democrat and Rome Beauty trees were uprooted. Trees which had received 1 lb. of borax showed a quite normal healthy root system, while the roots of trees which had received 10 lb. of borax over two years were almost completely dead. The 10 lb. of borax had destroyed all the main root system, but apparently the trees were capable of surviving with the support of a few small, what appeared to be new, roots close to the trunk and surface of the soil.

Generally it may be stated that boron injury on mature trees is confined to root damage primarily. As a result of this, dead areas may be found extending up the trunk and the foliage and growth may be adversely affected. Many severely affected trees still growing in the orchard appear to have a very poor hold in the soil and most probably the roots of these trees are also destroyed.

(*c*) *Fruits.*—The development of fruits on trees which have been severely damaged by a heavy application of borax is greatly restricted and in many cases the apples at maturity are no more than one inch in diameter.

The texture and general quality of the fruit is also affected; the apples may be very soft and unpalatable.

The colour of fruit is also noticeably affected. Granny Smith and Cleopatra varieties retain an intense dark-green colour for some time after harvesting.

Damage to Foliage of Young Apple Trees by Excessive Amounts of Borax in Solution.

A number of yearling Granny Smith apple trees were planted out on 12th September, 1938, and then sprayed with a borax solution at varying strengths on 9th November, 1938.

The damage caused to the foliage by some of the treatments varied considerably. The following is a brief summary of the results:

Treatment.	No. Trees in Plot.	Damage to Foliage (burning of leaves) after Treatment. In 2 days.	In 28 days.	In 63 days.
No treatment	4	All trees vigorous—foliage normal.		
Sprayed 2 per cent. borax solution.	1	Tree vigorous—foliage normal.		
Sprayed 4 per cent. borax solution.	4	2 trees severe ... 1 tree very slight ... 1 tree normal ...	No further burning of foliage on affected trees.	Hardly a sign of original burning. Trees vigorous.
Sprayed 6 per cent. borax solution.	4	2 trees severe ... 2 trees medium ...	No further burning of foliage.	New foliage normal.
Sprayed 8 per cent. borax solution.	4	2 trees severe ... 2 trees slight ...	No further burning of foliage.	,, ,,
Sprayed 10 per cent. borax solution.	4	2 trees slight ... 2 trees very slight ...	No further burning of foliage on any tree.	,, ,,

"Measles" Condition of Delicious Apples.

A condition commonly called "measles" is found affecting Delicious apple trees over most areas of the State. Measles is readily recognised and manifests itself as small, raised, rounded pimples on the outer bark. The size of the pimples varies considerably and ranges from 1/16 inch to ¼ inch areas where they appear to have run together. On cutting the bark just under the pimples, dark areas are exposed to view (Fig. 13). Severely affected limb and lateral growths often make poor and slow growth and take on a hard appearance.

A number of severely affected Delicious trees at Glen Innes Farm were treated with borax during 1940. On a recent inspection of the trees, it was found that trees treated with borax showed a marked improvement in health as compared with the untreated trees. Similar results were obtained in the Kentucky district when borax was applied to Delicious trees in that area. In both these areas the improved condition of the bark on the trunk and main limbs was very noticeable.

The work carried out to date in this State indicates that lack of boron in certain areas may cause "measles" in Delicious trees, and the application of borax to the soil will correct the trouble. In other parts of the State Delicious trees affected with "measles" have shown little to no improvement when borax has been applied to the soil. This indicates that measles may be caused by one or more factors. However, this work is being continued and further tests are expected to yield more definite results concerning this disorder.

Recommendations for the Application of Borax to Apple Trees.

For the Control of Boron-deficiency Disease.

SOIL DRESSINGS.

These are most effective and convenient and are recommended in preference to spray applications.

The amounts set out below should be applied once only and not repeated until necessary (see recommendations as to repeat applications).

Young, non-bearing trees should not be treated with borax—even small amounts applied to the soil may cause serious damage. If it is considered that the growth of young trees is restricted because of boron deficiency, advice should be sought on the matter. Where considered necessary a borax spray may be recommended.

AMOUNT OF BORAX TO APPLY.

Young non-bearing trees—nil per tree.
Small bearing trees—¼ lb. per tree.
Medium-sized trees—½ lb. per tree.
Large trees—1 lb. per tree.

When to apply.—Dressings should be applied during the months of June, July or August.

Method of Applying.—The borax should be spread very evenly on the soil in a ring 2 feet wide commencing 2 to 3 feet from the butt of the tree, and then lightly worked in with a suitable implement. Ploughing in is not considered advisable as it may result in an excessive amount of borax being brought into direct contact with the roots.

When to Repeat the Applications.—One dressing of borax should be sufficient for a number of years. Do not make the second application until such time as it is obvious that the trees are again beginning to suffer from a deficiency of boron. If the fruit is examined each year for signs of a corky condition, it should be easy to judge when the time has arrived for a second application. Records to date show that one dressing of borax is quite effective for, at least, five years.

SPRAY APPLICATIONS.

This method of supplying boron to the tree may be of special importance when supplies of borax are very limited. It may also be used to advantage when trees are only slightly affected, very young, or when a grower for any reason has left it too late to apply a soil dressing.

The Spray.—A 25 per cent. (2½ lb. of borax to 100 gallons of water) solution is quite sufficient. Care should be taken to see that the correct quantity is used. The borax should be dissolved in a small quantity of water (heated if necessary) and then added to the spray tank of water. The agitators should be moving while the borax solution is being added. Other spray materials such as arsenate of lead and lime sulphur may be safely combined with the borax.

When to Apply.—A borax spray combined with the usual arsenate of lead spray for the control of codling moth, applied at the calyx stage, is most convenient and effective. Later sprays may not prove effective as the disease is sometimes noticeable as soon as the fruit is formed.

Method of Applying.—It is essential that the spray should be applied thoroughly. Special care should be taken to make sure that all parts of the tree are covered. Failure to do this will result in a poor control being obtained.

Fig. 13.—"Measles" Condition of Delicious Apple.
Left.—Healthy limb. *Right*—Limb affected with "measles."

When to Repeat the Application.—It is desirable that the borax spray be applied each year. However, after repeating the applications for two to three years, the borax spray may be omitted for one year without causing any ill effects.

Apply Borax with Care.

The careless use of borax both in respect to dosages and to the method of application has already caused severe damage, and attention is again drawn to this fact.

Growers are warned not to depart from the recommendations of methods of application laid down by the Department.

Removal of Arsenical Residues from Apples.

Experiments at Bathurst Experiment Farm.

J. D. BRYDEN, Senior Orchardist and E. G. HALL, B.Sc.Agr., Fruit Research Officer.*

THE requirements of the New South Wales Pure Foods Act make it obligatory for all fruit growers to remove lead arsenate spray deposits from fruit, so that residues will be reduced below an amount regarded as safe to the health of the consumer. The maximum amounts of spray residues allowed are one-hundredth grain of arsenic (As_2O_3) and three-hundredths of one grain of lead (Pb) per pound of fruit.

Similar requirements are specified by the authorities in Great Britain and in the United States of America.

Experiments conducted at Bathurst Experiment Farm and described in this article indicated that washing apples by machine in 1 per cent. hydrochloric acid efficiently reduced normal lead arsenate residues to below the prescribed tolerance, and that best results were obtained with the acid solution at a temperature of 80-90 deg. Fahr.

Storage tests conducted with the treated fruit are also discussed.

Following the introduction of these tolerances for lead and arsenic on fruit by Great Britain in 1926 and the United States of America in 1927, considerable attention was given to the problem of arsenical residues on apples by producers in various parts of the world, and investigations were initiated in many countries to determine a satisfactory method of reducing the amount of arsenic on fruits.

Previous Investigations.

In 1930 investigations were commenced at Bathurst Experiment Farm by the New South Wales Department of Agriculture. Here preliminary work aimed at determining the amount of residue to be expected following the use of certain spray programmes for the control of codling moth and also to test the use of hydrochloric acid as a washing agent. In 1931 and 1932 the investigations were extended to gather information on a number of points related to the main problem of reducing arsenical residues below the prescribed limit.

The results of these earlier experiments † indicated that apples which had received three applications of spray containing arsenate of lead in the recommended proportions would, at the time of harvesting, have residues above the amounts allowed, despite a slight reduction which could be expected due to normal weathering of the deposits.

In all apple growing areas of New South Wales several applications of arsenical sprays are required to control the codling moth. In districts of comparatively low rainfall, and particularly during dry seasons, it might be found necessary to apply six or seven control sprays in an effort to cope with the larger populations of the pest usually occurring under drier conditions. In these circumstances it is apparent that spray programmes for the control of the codling moth in this State would almost invariably result in apples having excessive amounts of arsenical residues when harvested.

With regard to the actual removal of spray deposits the experiments showed that arsenical residues could be reduced to within the tolerance limit by washing the apples in hydrochloric acid solution. It was revealed that the use of white oil in the spray programme resulted in the residues being more difficult to remove, and it was also shown that apples should be treated immediately after harvesting, at which time the action of the acid solution was most efficient in removing residues.

Subsequent tests ‡ showed sodium carbonate 8 per cent. and 12 per cent. to be approximately equal to hydrochloric acid 1½ per cent. in removing residues where the sprays consisted of lead arsenate and calcium caseinate, but less effective where white oil had been included in the cover sprays.

A Machine-Washing Trial.

In 1938 a machine designed for the purpose of washing fruit was installed at

* The analytical work in connection with these experiments was carried out by the late Mr. L. T. Wilson, B.Sc.Agr., Analyst.

† "Removal of Arsenical Residues from Apples"—Ballantyne, J. A. and Cayser, L. S., *Agr. Gaz., N.S.W.*, June, 1932, p. 459.

‡ "Removing Arsenical Residues from Apples". *Agr. Gaz N.S.W.*, March, 1934, p. 147.

Bathurst Experiment Farm Orchard. The equipment provided for operations of soaking, brushing, overhead spraying and drying. Tests were carried out immediately to develop a washing technique which would give a high standard of efficiency.

In operation the fruit was placed in the soaking tank containing acid or other solution for the required time, and was then conveyed to roller brushes. As the apples passed over these cleaning brushes they were sprayed with either solution from the soaking tank or with a different solvent solution. They then passed over a second set of brushes under a water spray which was designed to rinse off acid and any soluble arsenic. From the rinsing section the fruit passed through a short drying tunnel against a blast of unheated air.

It had already been shown in previous tests* that arsenic was more easily removed by increasing the temperature of the acid solution, and also that some varieties showed a tendency to injury due to the action of the acid.

These points required further examination and consequently in 1939 it was decided to explore the possibilities of warm washing and at the same time greater attention was paid to the effects of various treatments on the keeping qualities of apples under cool storage conditions.

Experiments with Jonathans in 1939.

In 1939 Jonathan apples were washed in hydrochloric acid solutions of 1 per cent. and 1½ per cent. concentrations, and in addition an 8 per cent. solution of sodium silicate, followed by acid washing.

The 1939 washing treatments were as follows:—

1. (*a*†) Soaking in HCl 1 per cent. for 3 minutes, spraying with acid, rinsing spray and drying.
   (*b*†) Soaking in HCl 1 per cent. for 2 minutes, double spraying with acid, rinsing spray, no drying.
   (*c*†) Soaking in HCl 1 per cent. for 3 minutes, spraying with acid, double rinsing sprays, no drying.
   (*d*†) Double spraying with HCl 1 per cent., rinsing spray, no drying.
   (*e*†) Soaking in HCl 1½ per cent. for 3 minutes, double rinsing sprays, drying.
   (*f*) Soaking in HCl 1 per cent. for 2 minutes, spraying with acid, rinsing spray, drying. Temperature of acid solution 105-110 deg. Fahr.
   (*g*†) Soaking in HCl 1 per cent. for 2 minutes, spraying with acid, rinsing spray, drying.
   (*h*†) Soaking in HCl 1 per cent. for 2 minutes, spraying with acid, rinsing spray, drying.
2. (*a*) Soaking in sodium silicate 8 per cent. for 3 minutes, spraying with sodium silicate, rinsing spray, no drying.
   (*b*) Soaking in sodium silicate 8 per cent. for 2 minutes, spraying with sodium silicate, rinsing spray, no drying.
3. Soaking in sodium silicate 8 per cent., rinsing spray, spraying with HCl 1 per cent., rinsing spray, no drying.

*"Removal of Arsenical Residues from Apples"—Ballantyn . A., and Cayzer, L. S., *Agr. Gaz., N.S.W.*, June, 1932, p. 459.

† In es s 1 (*a*), (*b*), (*c*), (*d*), (*e*), (*g*) and (*h*), the temperature of the washing solution was 70 deg. Fahr.

The spray programmes applied to the Jonathan apples used in 1939 were as follows:—

A.—One calyx and six cover sprays of arsenate of lead, 24 oz.-50 gals., and calcium caseinate 1 lb.-100 gals.

B.—One calyx and two cover sprays of arsenate of lead, 24 oz.-50 gals., and calcium caseinate 1 lb.-100 gals. Four cover sprays of arsenate of lead, 24 oz.-50 gals., calcium caseinate, 1 lb.-100 gals., and white oil 1 per cent.

Determination of Residues.

The results of analyses for arsenic and lead residues are shown in Table I.

For the arsenic residues a difference of 0.003 or more grains per lb. in the means given in Table 1 may be taken as significant. Although a strict statistical comparison of the lead results was not possible, a general examination of the lead means indicated the general trends, these being found to follow those of the arsenic results fairly well.

Examination of the figures for arsenic residues revealed that the most successful treatments were those employing 1 per cent. HCl at 105-110 deg. Fahr. (test 1(*f*)), and 1½ per cent. HCl at 70 deg Fahr. (test 1(*c*)).

Sodium silicate showed up very unfavourably in comparison with other treatments, as only about 40 per cent. of the original residues were removed.

Only one treatment, 1(*f*), was completely satisfactory in regard to residue removal, while 1(*e*) was on the border line and several others, viz. 1(*c*), 1(*a*), 1(*h*) and 1(*d*) were only slightly above the specified limit.

Cool Storage, 1939.

Treated and untreated fruit was placed in cool storage at the Food Preservation Laboratory, Homebush, in order to determine whether washing treatments injured the fruits or affected the development of wastage during cool storage. The fruit was held for seven months at 34 deg. Fahr., and was examined after two weeks post storage at room temperatures.

TABLE 1.—Analyses, Arsenic and Lead Residues, 1939, Jonathan.

Test.	Spray Programme.	Washing Agent and Temperature.	Residues—Mean. Arsenic.* (As_2O_3 grs./lb.).	Residues—Mean. Lead. (Pb. grs./lb.).
1 (*a*)	A Lead	1 per cent. HCl 70 deg. Fahr. ...	·013	·034
1 (*b*)	A	1 per cent. HCl 70 deg. Fahr. ...	·020	·045
1 (*c*)	A	1 per cent. HCl-70 deg. Fahr. ...	·013	·029
1 (*d*)	A	1 per cent. HCl-70 deg. Fahr. ...	·015	·029
1 (*e*)	A	1½ per cent. HCl-70 deg. Fahr. ..	·011	·028
1 (*f*)	A	1 per cent. HCl-105 deg.-110 deg. Fahr.	·009	·018
1 (*g*)	B Lead-oil ...	1 per cent. HCl-70 deg. Fahr. ...	·028	·060
1 (*h*)	A	1 per cent. HCl-70 deg. Fahr. ...	·014	·032
2 (*a*)	A	8 per cent. Sod. silicate	·030	·060
2 (*b*)	A	8 per cent. Sod. silicate	·032	·060
3	A	(*a*) 8 per cent. Sod silicate; (*b*) 1 per cent. HCl	·017	·032
Check	A	No treatment	·047	·105
Check	B Lead-oil ...	No treatment	·118	·246

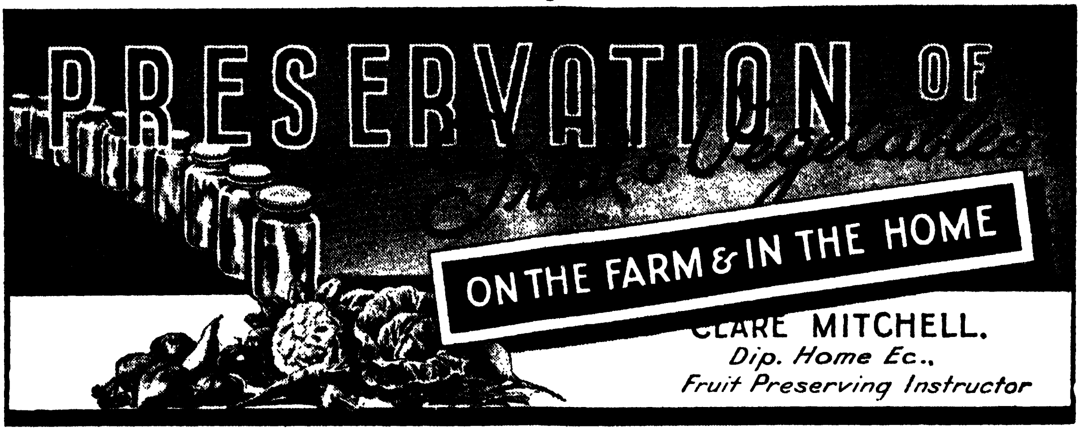
* For the arsenic residues a difference of [illegible] or more grains per lb. may be taken as significant.

TABLE 2.—Percentage Wastage after Cool Storage, and Post Storage in Jonathans, 1939.

Treatment.	Calyx Rots ex Cool Store.	Calyx Rots.	Total Calyx Injury.	Jonathan Spots.	Lenticel Spot.	Mould.	Breakdown.
Check (No Treatment)	0·0	0·0	0·0	57·6	1·6	7·2	4·8
1 (*a*)	7·2	12·8	21·6	42·6	0·8	6·4	4·8
1 (*b*)	4·0	7·2	12·8	34·2	8·8	8·4	4·8
1 (*c*)	1·6	3·2	16·8	44·0	9·6	7·2	2·4
1 (*d*)	0·0	0·0	5·6	58·4	13·6	6·4	2·4
1 (*e*)	12·0	25·6	34·4	44·8	8·8	2·4	2·4
1 (*f*)	17·6	19·2	81·6	45·6	4·8	4·8	0·0
1 (*g*)	4·8	6·0	24·8	52·1	2·8	11·6	0·0
1 (*h*)	0·8	1·6	10·4	38·0	15·1	6·4	5·6
2 (*a*)	0·0	1·6	15·2	03·2	0·0	5·6	2·4
2 (*b*)	0·0	2·4	21·6	36·0	5·6	5·6	0·0
3	0·0	0·0	16·0	39·2	0·8	4·0	4·0

Before washing there was about twice as much residual arsenic and lead on the fruit which received combination lead and oil sprays, as there was on fruit which was sprayed with lead arsenate only. This difference persisted after different washing treatments.

(*Continued on page* 200.)



PRESERVATION OF FRUIT JUICES.

(*Concluded from page* 143).

THIS month a further portion of an article on the preservation of fruit juices, by Mr. E. G. Hall, Fruit Research Officer, which appeared in the *Agricultural Gazette* several years ago, is reprinted. In last issue details were given of the preservation of the juices of stone and pome fruits; in this issue the preservation of citrus fruit juices is discussed.

Preservation of Citrus Juices.

The Vitamin C Content.

The juices of citrus fruits are an extremely valuable source of ascorbic acid or Vitamin C, the only other readily available comparable sources being green, leafy vegetables—particularly vegetables of the cabbage family, which must be correctly cooked—tomatoes and also potatoes (because of the amount which is usually eaten). New potatoes cooked in their skins are a good source of Vitamin C.

Certain berry fruits, particularly black currants and guava fruits, are rich in Vitamin C, and passion fruit contains very useful amounts of this essential vitamin. Most stone and pome fruits contain negligible amounts of Vitamin C.

Average figures for the Vitamin C content of freshly-extracted juices are:—

	Milligrams. Per cent.*	Milligrams. Per pint.
Orange	60	340
Lemon	45	250
Grapefruit	35	200
Mandarin	30	170
Tomato	25	140
Passion fruit	25	140
Pineapple	15	80

There is more Vitamin C in orange juice than in other citrus juices, and there is slightly more in Valencia orange (60-65 mgms. per cent.) than there is in Navels (55-60 mgms. per cent.). An adequate daily intake of Vitamin C for a child or an adult is about 60 milligrams, and this amount can be obtained from a quarter of a pint of fresh orange juice or about half a pint of home preserved orange juice. It is not usually necessary, however, to drink this amount of orange juice or its equivalent in other juices or fruits per day, as the daily consumption of correctly cooked, green, leafy vegetables and potatoes, parsnips or turnips will provide considerable amounts of this essential vitamin. It should be remembered that Vitamin C in cooked vegetables is rapidly lost if they are not eaten as soon as cooked.

* Used as an abbreviation for milligrams per 100 c.c. of liquid or per 100 grammes of solid material.

Difficulties of Preservation.

Although 50 per cent. of the Vitamin C in the juice can be retained by methods suitable for preserving in the home, these methods result in considerable undesirable changes in the juice. Citrus juices, particularly orange juice, are difficult to preserve, even commercially, and in home preservation the development of bitterness, loss of natural flavour, darkening of the colour and other changes in the appearance of the juice can be expected.

These changes and the loss of Vitamin C, which still go on slowly during storage, are accelerated by contact with most metals, particularly iron and copper. During all stages of preservation, therefore, the juices should not come in contact with any metals except stainless steel or aluminium. The production of orange juice with a reasonably good flavour and appearance is not possible in the home, and under commercial conditions requires the use of expensive equipment for vacuum de-aeration and flash pasteurisation.

Selection of the Fruit.

It is recommended that the home preservation of the juice of navel oranges should not be attempted, as it quickly becomes objectionably bitter. Valencias and other seeded oranges are satisfactory, but the best juice with least bitterness

and most flavour, is obtained from Parramatta seedling oranges. The juice of lemons, grapefruit, and limes can be preserved satisfactorily in the home. Not much is known about mandarin juice, but it is probably somewhat easier to preserve than orange juice, but more difficult than the other juices.

The fruit used should be mature, as the juice from immature fruit will develop considerable bitterness. It must be sound, clean and well washed, and all utensils used must be scrupulously clean in order to reduce initial contamination of the juice to a minimum.

Extraction of the Juice.

After slicing in half with a stainless steel knife the juice may be extracted on the larger type of glass or plastic squeezer which has a large ribbed cone; the small old-fashioned type of lemon squeezer which has a small pointed cone is of little use. Extractors with an electrically-driven cone may be used, but they aerate (froth) the juice more than hand reaming. Increased aeration of the juice will increase the development of bitterness and the loss of Vitamin C. However, this method will be quicker than hand reaming, and thus will allow less time for absorption of oxygen from the air.

After extraction the juice should be handled rapidly to minimise undesirable changes before bottling. The juice should next be strained through a double thickness of cheese-cloth or even an aluminium or enamel colander to remove coarse seeds and pulp. If cloth is used the pulp in the cloth should be well squeezed to obtain as much juice as possible.

Sweetening.

The addition of sugar helps to retard deterioration of the juice, and usually improves the palatability. It is impossible strictly to lay down the amount of sugar to be added because of the variability in the fruit and the variability in individual taste.

In the case of orange and mandarin juice the amount to be added can best be determined by taste. Grapefruit juice, because of its natural bitterness and usually greater acidity, generally requires the addition of more sugar than does orange juice, and up to 2 lb. sugar may be added to each gallon of juice. A popular commercial grapefruit juice is made by mixing 7 pints of juice with 3 pints of 4 lb. syrup (syrup containing 4 lb. of sugar in a gallon of water, or ½ lb. per pint). Up to 4 lb. of sugar may be added with advantage to each gallon of lemon or lime juice.

Processing of Orange Juice.

If orange juice is not heated to a temperature of 203-5 deg. Fahr. it will clear during storage, that is, the suspended material in the juice will settle as a coarse deposit to the bottom of the bottle and will not redisperse on shaking to give the original normal appearance. Such "cleared" juice tends to have a weaker and slightly foreign flavour compared to fully processed juice.

However, the improved appearance obtained by heating to 203-5 deg. Fahr. is considerably offset by an increase in the degree of cooked or marmalade flavour. This can only be avoided if the juice is flash pasteurised, but this is not possible in the home. Although heating to 200 deg. Fahr. (which is high enough under home conditions) is recommended, the preserver could also try some heated to only 170 deg., as outlined below, for lemon and grapefruit juices, and could decide which method, in his or her opinion, produced the better juice. A temperature of 170 deg. Fahr. maintained for thirty minutes is quite adequate to pasteurise the juice.

The "Hot-fill" Method.

Immediately after filtering and the addition of sugar (and preservative if used), the juice is rapidly heated to a temperature of 200 deg. Fahr. (practically boiling) in a double aluminium or unchipped enamel saucepan, or in a single saucepan with continuous stirring to minimise scorching which is likely with direct heating. It is immediately poured hot into previously prepared hot bottles which are filled to overflowing. The bottles are then sealed and stood, upside down on wooden slats or bags or a cloth, in a hot water bath at 170 deg. Fahr. (when steam first appears), in which they are kept for thirty minutes. They are then taken out, cooled away from draughts (which may cause bottles to crack) and then stored in the coolest dark place available. The seal used must be quite airtight, otherwise the juice will not keep. A useful precaution is to dip the tops of the sealed bottles, while still hot, in molten paraffin wax.

The bottles are prepared by first thoroughly cleaning and then placing in cold water in the copper or other suitable vessel, with wooden slats or bags on the bottom to protect them from direct heat. The water is brought to the boil and boiling continued for ten minutes. The bottles are taken out and filled immediately with the hot juice.

Crown seals, Kork-n-Seals or corks can be used for sealing the bottles. Just before use, Kork-n-Seals and corks should be boiled for ten minutes in a saucepan with the lid on, but Crown Seals cannot be so sterilised, as the inner lining is destroyed.

The "Cold-fill" Method.

In this method cold, sterilised bottles are filled with cold juice, and then heated in a water bath. The bottles are first boiled and cooled away from draughts. The freshly extracted juice to which sugar and the preservative (if used) is added, is poured into the bottles until it reaches 2 inches from the top. The bottles are then stood in cold water to the level of the juice and the water is then heated until the juice reaches a temperature of 200 deg. Fahr. when the bottles are taken out and sealed securely. They are then put back in hot water at a temperature of 170 deg. Fahr. in an inverted position, and kept there for thirty minutes; then taken out, cooled and stored.

Lemon Juice and Grapefruit Juice.

These juices are more readily preserved than orange juice, and do not require heating to a temperature higher than 170 deg. Fahr. Any developed bitterness, which is less than in orange juice, is masked by the high acidity of lemon juice and the natural bitterness of grapefruit juice. Furthermore, lemon and grapefruit juices are usually diluted before consumption.

It is reported that the incorporation of too much oil from the skin, which can happen when freshly picked lemons are extracted, spoils lemon juice. To overcome this, lemons should be held before extraction for several days after picking to "cure" and dry out the skin.

Except that the juice is heated only to a temperature of 170 deg. (simmering) before bottling in the case of the "hot-fill" method and in the open bottles in the case of the "cold-fill" method, the procedures are the same as those outlined for orange juice.

Mandarin and Lime Juice.

Mandarin juice is highly flavoured and coloured, and is reported to be somewhat more stable than orange juice. In the absence of detailed data on the preservation of mandarin juice it should be treated like orange juice; that is, heated to 200 deg. Fahr., although a small lot could be tried heated to only 170 deg. As mandarins are readily peeled the juice may also be extracted by pressing the peeled fruit.

Lime juice being very sour should be treated like lemon juice.

Preservatives.

Although the recommended heating treatments are quite sufficient to preserve the juices when scrupulous cleanliness is observed and the processing is carefully done, it is always safer to add preservative. Preservative should always be added if the juice is required to keep for more than one day after opening.

The preservative should be added to the juice before heating is commenced; that is, immediately after filtering and at the same time as the sugar is added, by dissolving in a little water and stirring into the juice. It is recommended that 1 grain of sodium benzoate and 2 grains of sodium or potassium metabisulphite be added to each pint of juice. If metabisulphite is not obtainable, use 2 grains of benzoate; if benzoate is not obtainable, use 4 grains of metabisulphite.

These amounts of preservative will be discernible to the taste, but when both preservatives are used there is less darkening and "off" flavour from the benzoate, and the taste of the combined preservatives is considered by many people to be less than when either is used separately. Metabisulphite alone is preferable to benzoate alone, as the taste is less to most palates, there is less darkening and metabisulphite has some preserving effect on Vitamin C. The use of the two preservatives, although allowed in America commercially, is not allowed here under the Pure Food Act but would be all right for private use. As a grain is a very small quantity, those preserving small quantities of juice for home use should get their chemist to weigh out the amounts of preservative required for each batch.

General Considerations.

All utensils and the place where the preserving is being done must be scrupulously clean, because citrus juices readily absorb odours and because initial contamination of the juice must be kept to a minimum.

The juice must not contact any metal except stainless steel or aluminium.

A kerosene tin is a useful vessel for processing small lots, as it is deep enough to cover upright bottles and also all work can be done in the kitchen without recourse to the laundry copper.

To obtain the best results all work should be done rapidly; there should be no delay between extraction and the commencement of heating, and heating should be done as quickly as possible, for any exposure to air or heat injures the flavour and destroys Vitamin C.

For the same reason the amount of air left in the bottle after it is sealed is reduced to a minimum by heating the juice in open bottles in the "cold-fill" method to drive off as much air as possible, and by filling the bottles to overflowing in the "hot-fill" method.

After processing, the bottles of juice should be stored in the coolest place available, because the rate of deterioration of the juice during storage increases as the storage temperature rises. It is also advisable to use brown or green glass bottles if available, instead of white glass bottles and to store them in the dark, for exposure to light tends to increase deterioration of the juice.

The maintenance of the temperatures within less than 5 deg. Fahr. of those given is necessary for best results and to do this the use of a thermometer is essential. However, if no thermometer is available a satisfactory product can be obtained by heating until the first bubbles appear, when 200 deg. Fahr. is indicated, and to the point when steam first appears, when 170 deg. is indicated. When using a thermometer the temperatures should be taken in the bottles by inserting the thermometer into the juice in the open bottles, or if the bottles are sealed a dummy, uncorked bottle of water should be processed also and the temperatures taken in it.

If a thermometer is purchased it should be one reading up to 240 degrees Fahr. and should be checked against a standard thermometer in both hot water at about 150 deg. Fahr., and in boiling water, as many thermometers sold have an error of sometimes 3 or 4 degrees. The correctness of a thermometer at the boiling point of water, which is 212 deg. Fahr. at sea level, can be tested by placing the bulb in rapidly boiling water and reading the temperature shown. It must be remembered, however, that the boiling point of water falls by 1 deg. for every 500 feet of elevation above sea level, thus at a place 2,000 feet above sea level the temperature of boiling water will be only 208 deg. Fahr.

Blending.

Very attractive products can be made by blending various citrus juices, and particularly by blending citrus juices with the juices of other fruits, especially pineapple, berry, apple and apricot juices. The blending is best carried out before processing. Mandarin juice blends well with lemon and grapefruit juices, and orange and lemon and orange and grapefruit are satisfactory blends. In the latter case Navel oranges can be used, as their bitterness will be masked by the natural bitterness of the grapefruit juice. Blending equal

(Continued on page 218.)

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INSECT PESTS.

Notes contributed by the Entomological branch.

White Ants or Termites *(Termitidae)*.

WHITE ANTS or termites, although they somewhat resemble ants in appearance, are not closely related to the ants but belong to a much more primitive order of insects. They are responsible for many thousands of pounds worth of damage annually, and attack or destroy the woodwork of houses, telegraph poles, railway sleepers, fence posts, etc., and also growing trees, grape vines and shrubs. Even potatoes, tomatoes, tree dahlias, roses, stacked wheat, and lump sugar in wooden boxes have been infested.

White ants will attack most softwoods and hardwoods, but some are more resistant than others. Resistant timbers commonly used in Australia are jarrah (*Eucalyptus marginata*), cypress pines (*Callitris* spp.) and American redwood (*Sequoia sempervirens*).

They are social insects which live in large colonies in nests, in or on the ground, and in trees and stumps. Working underground they are often not detected until considerable damage has been done, and when working in timber they sometimes leave only a thin shell of wood on the outside, the timber being practically destroyed before their presence is discovered, either accidentally or through the collapse of the structure.

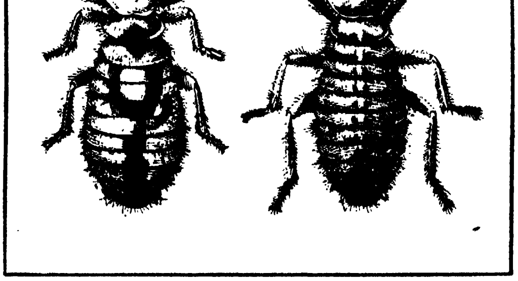
Colony Development.

In the white ant colony three different groups or castes are to be found, viz., workers, soldiers and male and female forms. The workers, which constitute from 80 to 90 per cent. of the colony in our common pest species, are small, white-bodied, blind insects which carry on the work of nest building, foraging for food and caring for the young and reproductive forms. The soldiers, which may constitute from 2 to 3 per cent. of the colony, are blind and are provided with much longer jaws. Their function is to protect the nest from invaders.

Once a year, commonly in warm humid weather, swarming occurs and winged male and female forms leave the nest. After a flight their wings fall off, pairing occurs and some succeed in founding new colonies in the ground adjacent to timber or in old stumps, etc.

After the first brood of young has been produced the female white ant becomes almost incapable of movement, for the abdomen becomes greatly distended by the large mass of eggs developed. This female is then known as the queen and becomes the central figure in the nest which the workers build up. The queen may live and continue to lay eggs for many years. Supplementary queens are occasionally found.

White ants, normally, feed on vegetable substances, mainly timber, and the workers



White Ants.
Left.—Worker. *Right.*—Soldier.

travel considerable distances underground from their nest to reach food supplies. They will never work in the light, and if they have to cross open spaces the workers construct covered runways. On account of these habits they are never seen unless disturbed. The workers travel to and from the nest to their food supply in a continuous stream and cannot exist without communication with their nest.

Treatment of Timber.

The most effective liquid in general use for the treatment of timber, to prevent white ant attack, is creosote oil, and the best method of using this substance is to impregnate the timber under pressure, as the effectiveness of the treatment depends on the degree of penetration obtained. A lesser degree of penetration may be obtained by heating the oil to boiling point and immersing the timber in it.

Where impregnation under pressure or by heating cannot be practised, soaking in creosote oil for 24 hours is the next best method. Fairly satisfactory results may be obtained by dipping, brushing, or spraying the timber twice with the oil, allowing an interval of 24 hours between each treatment.

For the protection of fencing posts, poles, or any timber which has to be placed in the ground, that portion which is to be put in the soil, and the portion near soil level, and also the soil to be replaced in the hole around the timber, should be thoroughly treated with the creosote.

Where the timber is not exposed to the weather, a solution of arsenite of soda in water (1 lb. to 2 gallons) may be used instead of the oil, but great care should be exercised in its use as it is extremely poisonous.

Creosote oil causes a dark brown stain and also prevents painting or varnishing for some time after it has been applied, but this does not matter with woodwork in concealed portions of houses.

Preventive Measures When Building.

It is important that all stumps, roots and timber should be removed from the soil in the vicinity of the proposed structure, as frequently these are sources of infestation.

The flooring should be raised well off the ground on concrete or brick foundations, so that no timber is in direct contact with the ground. There should be good ventilation and sufficient room to carry out an inspection of the flooring from underneath. All timber, as far as practicable, should be treated with the oil, and where timber has to be placed in or on the ground it should be treated as described above. Even where the foundation timbers are well above the ground they should be treated as an additional protection in localities where white ants are very troublesome. Additional treatments given every three to five years will extend the period of immunity to attack.

The piers supporting the flooring should be capped with metal, and experience in South Africa has shown that a flat zinc-composition plate ⅛ inch thick, projecting two or three inches, and cut with a square edge, gives excellent protection, but an ordinary galvanised iron capping can be recommended.

Remedial Measures.

When white ants have gained access to a building, treatment with white arsenic, Paris green, or sodium silico-fluoride dust is recommended. The first two mentioned are very poisonous and must be used with care. Sodium silico-fluoride is much less toxic to man and is to be preferred in situations where the use of the more dangerous poisons may involve some risk.

The effectiveness of these poisons depends to some extent upon the degree of their fineness, and dusts that will pass through a 200-mesh sieve are best. The object in using the dusts is to place a small quantity of the poison in the galleries where the insects must come into contact with it. This may be accomplished by carefully opening portions of the woodwork containing living termites, and with a small insect powder blower, or other small dust gun, blowing into the galleries about ⅛ oz. of the poison.

The openings may be made by gently prizing up the infested wood or boring small holes into it. Any breaks or openings thus made should be sealed up after the dust has been blown in. An essential feature of the treatment is to disturb the activities of the insects as little as possible.

This treatment should be repeated at a number of different parts where the white ants are known to be present, and the woodwork should then be left undisturbed for three or four weeks, when the replacement of badly damaged timber may be undertaken.

It is advisable to treat, at the same time, all woodwork in contact with the foundations or ground, thoroughly with creosote oil. The oil may be applied with a brush or spray pump, and chiefly to the wall-plates and floor joists resting upon them for a foot or more from their ends. All loose mortar should be scraped away from the wallplates.

If possible, the nest, which may be either under the building or even up to 50 yards or more from it, should be dug up and burnt, and the soil drenched with creosote oil. If this is done, the remaining white ants in the building will die out.

If the nest cannot be located, then the point of entry should be found, if possible, by tracing back the damage. Entry may be made either through timber in contact with the soil, or through cracks in the foundations. These cracks should be filled up and no timber allowed to remain in direct contact with the soil. The ground alongside all the foundations of the building should be drenched with creosote oil.

Prevention and Control in Fruit Trees, etc.

When clearing land for orchards or vineyards, great care should be taken to remove all stumps and roots from the ground and to destroy any white ant nests in the vicinity.

When trees become infested, cut out the damaged wood if possible. Dead or dying infested trees should be removed and burnt. Avoid scarring the trees near the base as these scars are likely to induce white ant attacks.

Where the roots are attacked the use of paradichlorobenzene or some other fumigant is suggested. This will destroy the white ants attacking the roots and in the adjacent soil, and will act for a time as a preventive. To apply the paradichlorobenzene, dig a circular trench 3 to 4 inches deep at a distance of 6 inches from the trunk of the tree, and scatter 2 oz. of the fumigant on the bottom of this, afterwards filling in with soil. The fumigant is more active when the soil is warm than when it is cold, and is not effective when the soil is saturated with water. For young trees a dose of 1 oz. is sufficient. If necessary the treatment should be repeated. The dosages must be measured carefully, as excess of this substance is likely to kill or damage the tree.

Paris green has also proved effective in controlling white ants infesting the trunks of fruit trees, and various ornamental and street trees. The method recommended is to bore an auger hole about ¼ inch in diameter into the centre of the trunk a little above ground level, and then blow about one-sixth ounce of powder into the hole and seal the opening with grafting wax or putty.

When grape vines are infested an auger hole may be bored about 12 inches, or less, above the ground into the pith in the centre of the main stem. About one-sixth ounce Paris green is then blown into the opening by means of a small hand blower, the opening afterwards being filled with grafting wax.

The Bean-seed Weevil (*Bruchus obtectus*).

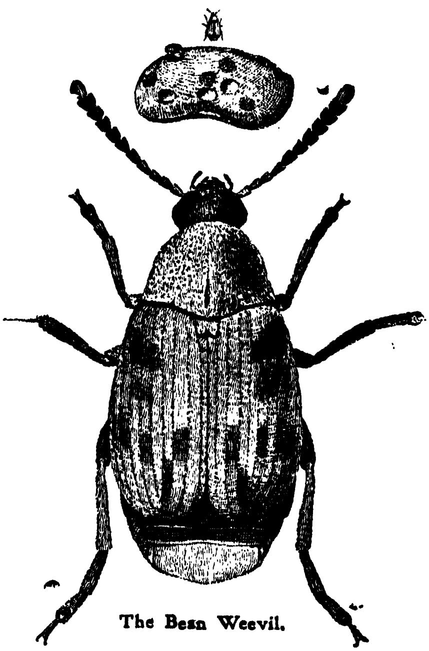
THE bean weevil may attack various types of bean-seed either during growth in the field or later during storage.

When the infestation commences while the beans are on the plants, the injury that occurs is usually not sufficient to be noted at the time of harvesting the seed. The beetles, which are capable of flight, lay their eggs on the bean pods and the minute grubs which hatch from these eggs enter the pods and feed inside the developing seed. Soon after the crop is harvested, the grubs, which then measure about ⅛ inch in length, become fully-fed and ready to enter their pupal or chrysalis stage. They develop into adult beetles which make their way out of the seeds, leaving circular exit holes.

Where seed-beans in storage are attacked, the beetles lay their eggs amongst the seeds and several hundred eggs may be laid by

an individual female. The infestation in stored seeds may continue until but little is left within the seed coats.

The life-cycle during warm weather is three to four weeks, but during cooler periods may be several weeks longer.



The Bean Weevil.

Control.

Clean bean seeds may be protected from infestation by storing in stout muslin bags or in large tins which the beetles cannot enter.

Infested seed may be fumigated with carbon bisulphide in an airtight container, using 1 fluid oz. to 16 cubic feet of air space. The liquid may be poured over the seed or placed in a shallow vessel on the top. The fumigation should not be allowed to proceed longer than twenty-four hours as the germination of the seed may be affected; and after fumigation the seed should be spread out on an insect-free surface to dispel the fumes.

WARNING: Carbon bisulphide is highly inflammable and explosive; therefore no lights of any description (pipes, cigarettes, fires or embers, radiators, stoves, etc.) must be allowed in or near sheds or buildings during the process of fumigation with carbon bisulphide. The precaution should also be taken to cut off the electric current, and stream pipes should be allowed to cool before proceeding with fumigation.

Control of the weevils may also be obtained by dusting the seed thoroughly, with either copper oxychloride or kaolin, the quantity used being 1 lb. of either dust to 1 bushel (60 lb.) of seed. Dusting with sodium-fluosilicate and Ceresan, at the rate of 2 oz. per bushel, has also been found effective.

Every seed must be coated with the dust. The dusts (copper oxychloride and kaolin in particular) will prevent any adults that may emerge from the seeds from causing further infestation, but will not kill larvae already feeding within. These larvae will continue to develop and later emerge as adults which will die off.

The copper compound, sodium fluosilicate and Ceresan are poisonous.

Flaked naphthalene, mixed through the seed at the rate of 2 oz. per bushel, prevents infestation, and will protect lightly-infested seed from further damage. Naphthalene, however, if used after fumigation may affect the germination.

The Leaf-blister Sawfly (*Phylacteophaga eucalypti*).

THE leaf-blister sawfly attacks various species of eucalypts including the Red-flowering Gum (*Eucalyptus ficifolia*) and the Blue Gum (*Eucalyptus globulus*). In addition, the Brush Box (*Tristania conferta*), used as a shade and ornamental tree, may be seriously injured by these leaf miners.

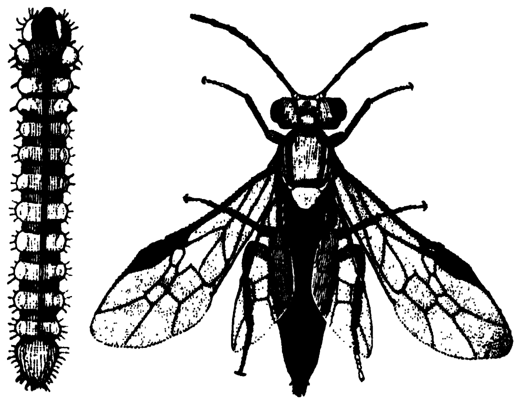
The members of the family *Tenthredinidae* to which the leaf-blister sawfly belongs, are medium or small-sized wasps with two pairs of wings and usually robust bodies. The females possess toothed, saw-like ovipositors, with which they cut the surfaces of the leaves when depositing their eggs, and it is from these, that they take their popular name of "sawfly."

The eggs of the leaf-blister sawfly are laid singly under the epidermis of the

leaves, but a number may be laid in different parts of the same leaf. The larva, on hatching from the egg, feeds on the tissues beneath the cuticle; the leaf becomes blotched and discoloured and a blister forms, which eventually may measure as much as 1½ inches across.

The larva, which measures about ⅜ inch in length when fully-fed, is slender and somewhat flattened, and the head and thorax are golden-yellow, the remainder of the body being paler in colour. When fully-fed the larva spins a thin, oval silken cocoon within the leaf-blister and therein enters its pupal or chrysalis stage. This stage lasts about a week and the pupa may be heard tapping on the sides of its cocoon with the tip of its abdomen when the leaf is disturbed.

The adult female, which measures about ¼ inch in length, has head and thorax light brown in colour and the abdomen black. The male, which is somewhat smaller than the female, has only the head reddish-brown, both the abdomen and thorax being black. In general form they are more slender than most sawflies and are very active when they first emerge from the leaves, running about and producing a loud buzzing sound.



Larva and Adult of the Female Leaf-blister Sawfly.

Control.

Where the infestation is not severe and the trees are small and limited in number, hand-picking and destruction of the leaves may be undertaken.

Control of the larvae in the leaves may be obtained by spraying with nicotine sulphate and oil solution diluted in the following proportions:—

Nicotine sulphate ..	1 fluid oz.
White oil emulsion ..	8 fluid oz.
Water	4 gallons

A second application of spray may be necessary two to three weeks after the first.

Dried Fruits Agreement with Britain.

"I CONSIDER the prices satisfactory, but even more satisfactory from the growers' point of view is the fact that the agreement ensures stablised export returns for the next three seasons," said the Minister for Agriculture, Hon. E. H. Graham, commenting on the recent announcement that Britain has agreed to purchase all currants, lexias and sultanas available for export by Australia during the 1946, 1947 and 1948 seasons. Contract prices per ton f.o.b. Australia are currants (1 crown and upwards) £40, sultanas (1 crown and upwards) £52, and lexias (4 and 5 crowns only) £51 10s.

Whilst stabilised prices at an acceptable level would be appreciated by growers, he felt, said Mr. Graham, that knowledge of the present food crisis in Britain and Europe would prove sufficient incentive to Australian growers to produce to the limit.

Free Training in Poultry Farming.

THE Minister for Agriculture, Hon. E. H. Graham, announces that arrangements can be made for trainees to be accepted on a non-resident basis for a short period of practical experience in poultry farming at the Poultry Experiment Farm, Seven Hills. In view of the experiment work in hand, however, only a very limited number of trainees can be admitted at the one time.

Applicants must be over fifteen years of age. No fees are charged, but services are to be given in return for the experience and any tuition provided.

Information as to when admission could be arranged, and any other particulars required are obtainable from the Under Secretary and Director, Department of Agriculture, Box 36A, G.P.O., Sydney.

Benzene Hexachloride ("666") and D.D.T. Applied to the Soil against Black Beetle.

THE following is a summary of the results of field tests on the South Coast, during the past six months, to develop field techniques of protecting crops and pasture from attack by black beetle (*Heteronychus sanctae-helenae*).

The insecticides were applied in six different ways.

Insecticidal Dusts Broadcast and Stirred Into the Soil by Tine Cultivator.—Dusts containing 2 per cent. D.D.T., 2 per cent. "666," 0.1 per cent. "666" and 0.025 per cent. "666" failed to protect maize when they were applied at the rate of 300, 200, 455 and 600 lb. per acre respectively. In another experiment D.D.T. and "666"—each at 2, 4 and 6 per cent.—were applied at the rate of 605 lb. per acre. Of these six treatments the 6 per cent. "666" dust gave by far the highest kill of beetles, and the soil treated with it remained lethal to beetles for at least three months. No ill-effect upon plants could be discerned in any of the six treatments.

Dusts Applied by means of the Maize Planting Machine.—The insecticide was placed in the fertiliser hopper and the seed maize in the seed-box; 10 per cent. D.D.T.-pyrophyllite, 4 per cent. D.D.T.-superphosphate and 2 per cent. "666"-superphosphate failed to protect maize when applied in this manner. The last-mentioned treatment, though it did not save the maize, produced a noticeable kill of beetles.

Dusts Stirred into the Soil in Very Narrow Strips.—Various insecticidal dusts were dropped on the soil and stirred in by means of a miniature hand cultivator to form a strip of treated soil, about 4 inches wide and 3 inches deep, in which the seed was planted. Of six dusts tested, 10 per cent. D.D.T. (at 1 lb. per chain) was outstanding, giving almost perfect protection of maize without apparent harm to the plants.

Dusts Stirred into the Soil in a Strip 10 inches Wide.—These tests were made with a 3 h.p. market garden tractor fitted with a fertiliser hopper and tine cultivator unit. The dusts were fed from the hopper into the soil in front of the tines, while a maize dropper coupled to the rear tine-bar sowed the seed. Against very heavy beetle attack, 2 per cent. D.D.T.-superphosphate and 2 per cent. D.D.T.-kaolin each failed to protect maize. In another experiment 2 per cent. "666"-superphosphate gave excellent protection against a moderate beetle infestation and also inflicted a heavy kill of beetles. Rates of application of these three dusts were about 18½ cwt., 7 cwt. and 18½ cwt. respectively.

Sprays Jetted at the Soil at the Base of Plants in Established Crops.—Sprays containing 0.15 per cent. of the para para isomer of D.D.T. caused beetles infesting maize and cauliflower crops to climb out of the soil and die at the surface. Even more striking results were obtained with a spray containing approximately 0.05 per cent. of the gamma isomer of "666." In rows of maize treated with the latter spray, the "666" remained lethal to the pest for at least a month.

Sprays Applied to the Soil Around and Above the Seed.—Seed was placed in open furrows and sprayed once. The furrows were then filled in to cover the seed with soil. The spray was then jetted along the surface soil overlying the seed. Both D.D.T. and "666" when used in this way gave several weeks' protection of maize.

This account of these trials is written as a progress report, not as a recommendation of the treatments described.—C. R. WALLACE, Entomologist.

Removal of Arsenical Residue from Apples.

(*Continued from page* 191.)

Wastage was mostly due to Jonathan spot, the incidence of which was high, but not significantly affected by any of the treatments. Some treatments increased lenticel spotting, but did not affect significantly wastage due to mould or breakdown. The results are given in Table II.

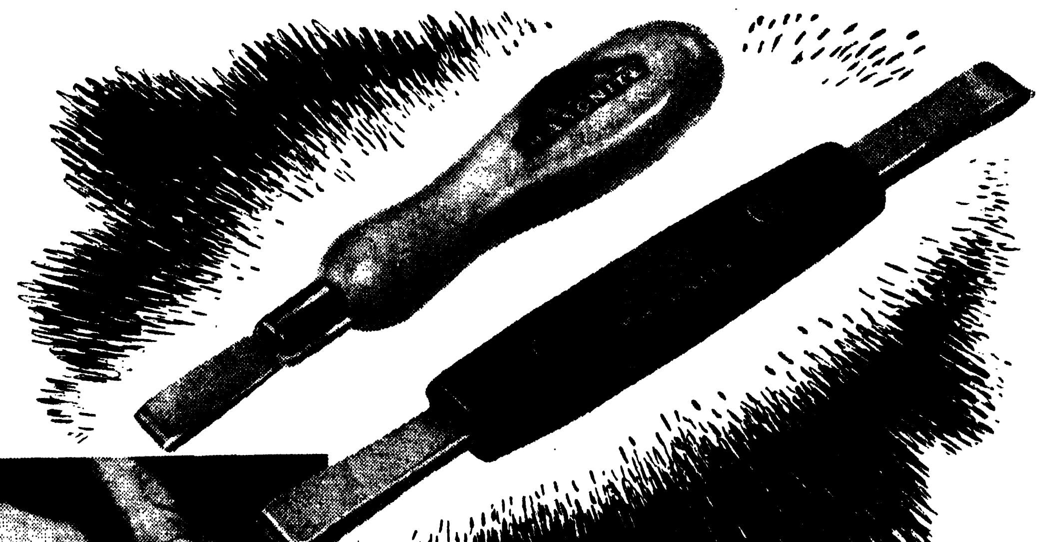
Injury caused by washing treatments took the form of browning or blackening of the skin in the calyx depression, and in some fruits this injured tissue was invaded by secondary fungi, producing calyx rots. These injuries were present on removal from cool storage and increased somewhat in severity during post-storage.

The greatest amount of injury was caused by treatment with 1 per cent. acid at 105-110 deg. Fahr. (test 1(*f*)), and considerable injury resulted from the use of 1½ per cent. acid (test 1(*e*)). Where fruit was merely sprayed with acid without previous soaking (test 1(*d*)) the results showed very little total injury and no calyx rots.

It will be noted that the treatments which were most satisfactory in removing spray residue caused considerable injury to the fruit after cool storage.

(*To be continued*).

and now . . . 2 NEW TOOLS



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CONTROL OF BLACK PEACH APHIDS

(*Anuraphis persicae - niger*)

By the Use of D.D.T.*

G. PASFIELD, B.Sc.Agr., Assistant Entomologist.

TWO applications of 0.1 per cent. D.D.T.-solvent naphtha-wetting agent spray controlled Black Peach Aphid infestations on plum and nectarine trees in the Young district in 1945. Three applications of the same spray did not yield better results than two.

The time taken for 100 per cent. mortality of these aphids varied between five and ten days from the date of spraying with 0.1 per cent. D.D.T., although up to 30 per cent. were dead and the rest appeared to be inactivated, except for a feeble waving of the legs, twenty-four hours after spraying.

Re-infestation of the trees was prevented for a minimum period of forty-seven days after spraying with D.D.T. and this infestation (two small colonies) appeared on one tree only. Other trees remained uninfested for periods ranging from forty-nine to seventy-seven days, and three trees were still free of infestation at the end of seventy-nine days, when all the trees were again sprayed in keeping with the planned spray schedule. At the time of this spraying, the first-infested tree had a light infestation of aphids and the other trees were only very lightly infested.

Three applications of nicotine sulphate sprays were inadequate for controlling the infestations on other trees. The mortality of aphids resulting from the first two of these nicotine sulphate sprays, applied during cool weather in late August and early October, was low, but almost 100 per cent. mortality resulted from the third spray applied during very warm weather in late October. The nicotine sulphate sprays lacked residual effect.

The Problem at Young.

In the Young district Black Peach Aphids have been found on the above-ground parts of stone fruit trees at various times throughout the year, but the main period of activity on these parts is between June and November. The appearance and increase in numbers of aphids seem to be closely allied to climatic conditions. Mild weather favours this appearance and increase, whereas the extremes of temperature appear to be unfavourable. During a mild autumn and winter, the aphid population can build up at such a rate that the laterals suffer severe curling and weakening, but it is generally during the warm and hot weather of September and October that the infestation becomes heaviest and, unless control measures have been practised, trees can be killed. Between December and June the aphids can generally be found only on the root systems of trees, as is also the case during a very cold winter, but they sometimes appear in small numbers on the above-ground parts during a few days spell of mild weather.

For some years there have been complaints that nicotine sulphate sprays were not satisfactory for controlling Black Peach Aphid infestations, and that it took between six and ten sprays, depending on the degree of infestation, to keep the trees free from aphids. This was not an economic proposition, and the common practice in the district has been to use two to four sprays per season, spraying only when the infestations had built up considerably. Die-back, curling and weakening of laterals and even the killing of trees, are a direct result of this practice.

An Experiment Planned.

Peaches, plums, nectarines, almonds and apricots in the Young district were infested with Black Peach Aphids during the 1945 season, the first three being heavily infested generally. Local authorities and growers were agreed that it was the heaviest infestation yet recorded in the district.

A few cherry trees, in close proximity to heavily-infested peach trees, in one orchard, became infested with Black Peach Aphids

* Dichlorodiphenyltrichloroethane (94–96 per cent p.p. isomer).

in the middle of October, but it is not expected that these aphids will become established on the trees.

Sixteen Narrabeen plum trees and twelve Goldmine and Irrawarra nectarine trees were made available for an experiment by Mr. C. F. Sackett. The Black Peach Aphid infestations on these trees were representative of the general infestation on trees throughout the orchard. These trees were about forty years old, the Narrabeens having been reworked on almond stocks and the Goldmines and Irrawarras on King Edward VII peach stocks.

Design of Experiment.

It was not possible to design a randomised block experiment with the available trees, but seven trees (four plums and three nectarines) were selected for each of the four treatments. In this selection careful attention was paid to obtaining an approximately even distribution of Black Peach Aphid infestations for each of the treatments, and these infestations varied from very light to heavy on the trees within the treatments at the beginning of the experiment.

The general plan of the experiment was to spray trees with 0.1 per cent. D.D.T., in three groups.—

A.—In the dormant stage and immediately after the blossoms had fallen.

B.—In the dormant stage, semi-dormant or early "pinking" stage and immediately after the blossoms had fallen;

C.—In the semi-dormant stage and immediately after the blossoms had fallen; and also in a fourth group—

D.—To leave trees unsprayed as checks until it became imperative to spray them with standard nicotine sulphate sprays.

The following are the actual treatments used:—

A.—Seven trees were sprayed with 0.1 per cent. D.D.T. on 11/7/45 and 28/9/45.

B.—Seven trees were sprayed with 0.1 per cent. D.D.T. on 11/7/45, 8/8/45 and 28/9/45.

C.—Seven trees were sprayed with 0.1 per cent. D.D.T. on 8/8/45 and 28/9/45.

D.—(i) Four plum trees were sprayed with nicotine sulphate-pale oil on 21/8/45 and with nicotine sulphate-soap on 3/10/45 and 25/10/45.

(ii) Three nectarine trees were sprayed with nicotine sulphate-pale oil on 21/8/45 and with nicotine sulphate-soap on 25/10/45.

(It was not, and is not, thought desirable to spray the trees while in blossom because of possible ill-effects to bees.)

All sprays were applied from a power sprayer with a pressure of about 225 lb. per square inch and—

1½ gallons of 0.1 per cent. D.D.T. spray per tree were required on 11/7/45.

2½ gallons of 0.1 per cent. D.D.T. spray per tree were required on 8/8/45.

3 gallons of 0.1 per cent, D.D.T. spray per tree were required on 28/9/45.

2½ gallons of nicotine sulphate spray per tree were required on 21/8/45.

3 gallons of nicotine sulphate spray per tree were required on 3/10/45.

3 gallons of nicotine sulphate spray per tree were required on 25/10/45.

The D.D.T. spray was made by dissolving 1 lb. of D.D.T. in 5 pints of solvent naptha and then adding ½ pint of a proprietary wetting agent. This 6 pints of stock emulsion in 100 gallons of water made 0.1 per cent. D.D.T. spray.

The nicotine sulphate-pale oil spray was made up of nicotine sulphate, 1 pint; pale oil, 2 gallons; and water 80 gallons.

The nicotine sulphate-soap spray was made up of nicotine sulphate, 1 pint; soap, 3 lb., and water 75 gallons.

All the experiment trees were sprayed with lime sulphur 1:20 on 27th August.

Rainfall.

The rainfall during the period of the experiment was as follows:—July (11th-31st) 91 points; August 334 points; September 83 points; October 242 points; and November (1st-12th) 50 points. The total rainfall was 800 points and 289 points fell between 11th July-8th August, 219 points between 8th August-28th September and 292 points between 28th September-12th November.

Observations.

In general, the Black Peach Aphid infestations on the nectarines were much lighter than those on the plums used in the experiment.

About 30 per cent. of the aphids on the fourteen trees sprayed with 0.1 per cent. D.D.T. on 11th July were dead and the rest appeared to be inactivated, except for a feeble waving of the legs, twenty-four hours later. Yet it took between five to ten days before 100 per cent. mortality was achieved.

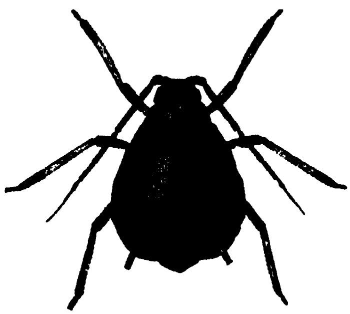
At the time of the next spraying with 0.1 per cent. D.D.T., on 8th August, these fourteen trees were still free of aphids, but the aphids on the other fourteen trees had spread to the top of all except one, although the increase in the population was only roughly 20 per cent.

On 28th August, two small colonies of aphids appeared on one tree of treatment A, forty-seven days after spraying, but the other trees of treatments A, B and C were still free of aphids. By this date, almost 100 per cent. mortality had occurred on the nectarine trees and one plum tree of treatment D sprayed on 21st August, but only about 50 per cent. mortality had resulted on the other three plums.

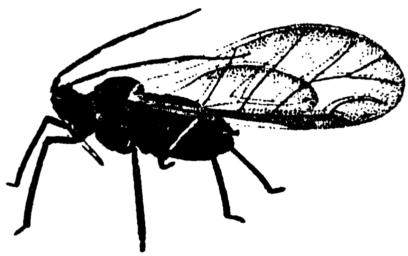
Only four trees (three plums and one nectarine) of treatment A were infested on 26th September, one plum lightly, the other two plums very lightly and the nectarine had two small colonies. Of the trees of treatment B only two plums were very lightly infested, and, in treatment C, four plums and two nectarines were very lightly infested, and the other was uninfested on this date. A considerable increase in infestation had occurred on the plums (one of which was very heavily infested) of treatment D, but there was only a small increase on the nectarines.

The next complete observations in this experiment were made on 17th October when all trees, except one, of treatments A, B and C were free from infestation. The infested one, in treatment A, had seven small colonies on two limbs and it appeared that these had been accidentally missed during spraying on 28th September. Of the four plums of treatment D, sprayed on 3rd October, about 50 per cent, mortality had resulted on three and only a negligible mortality on the one which was very heavily infested. The infestation on the nectarines of treatment D, last sprayed on 21st August, had increased considerably since 26th September.

On 31st October there had been no increase or spread of infestation on the infested tree in treatment A, and the rest of the trees of treatments A, B and C were still free of infestation. The four plums of treatment D had only two to four colonies of aphids on each and the nectarines were uninfested following the spraying done on 25th October. This was undoubtedly the best result achieved with nicotine sulphate spraying.



Adult wingless female.



Adult winged female.

The Black Peach Aphid.

All trees of treatments A, B and C were free of aphids on 12th November. Adults and larvae of the ladybird beetle, *Coccinella transversalis,* had wiped out the seven colonies on the tree in treatment A which was still infested on 31st October. Seven to twelve small colonies of aphids were found on each of the plum trees of treatment D but the nectarines were not infested.

The adult ladybirds were first observed during the week beginning 21st October. By the middle of November they were causing quite considerable mortality among aphids on trees, thus rendering further spraying unnecessary. The small number of adults and larvae seen on D.D.T.-sprayed trees on

12th November were quite active and showing no apparent symptoms of D.D.T. poisoning.

The value of the residual effect of the 0.1 per cent. D.D.T. spray in preventing re-infestation for long periods is further emphasised when the amount of rainfall during the experiment is considered.

There seemed to be some correlation between temperature and mortality of aphids by nicotine sulphate sprays, as the mortality obtained with the first two sprays applied during cool weather was relatively low, but the third spray applied during a very warm spell caused almost 100 per cent. mortality. This result was also noted in a nearby orchard where the infestation had been so heavy that a few trees appeared to have been killed and others severely damaged. The first two nicotine sulphate sprays in this case were applied between late September and the middle of October and the third in the last week of October.

The D.D.T. sprays had no apparent harmful effects on any of the trees.

Discussion.

The results of this experiment indicate that two 0.1 per cent. D.D.T.-solvent naphtha-wetting agent sprays—one applied in late June or early July and the other immediately after the blossoms have fallen—will protect stone fruit trees from damage by Black Peach Aphids in the Young district. If, by any chance, heavier Black Peach Aphid infestations are experienced than those of 1945, three sprays may be necessary—one in late June or early July, one just before or at the early "pinking" stage, and one immediately after the blossoms have fallen. Care should be taken not to spray during the blossoming stage so as to minimise the possible danger to bees.

A comparison of present prices of D.D.T. and nicotine sulphate sprays reveals that the former would cost approximately 2d. per tree per spraying more, but this extra cost is offset by the much better results obtained with fewer applications of D.D.T.

Acknowledgments.

I am deeply appreciative of the assistance given by Mr. S. A. Thornell, Fruit Inspector at Young, without which the experiment could not have been carried out. I wish to thank Mr. C. F. Sackett for making the trees available and for his wholehearted co-operation during the experiment. I also desire to acknowledge the help given in designing the experiment and in the application of the sprays, by Mr. E. J. Wason, Entomologist, who has worked on the Murrumbidgee Irrigation Area on this problem.

Agricultural Societies' Shows.

SECRETARIES are invited to forward for insertion in this list dates of their forthcoming shows; these should reach the Editor, Department of Agriculture, Box 36A, G.P.O., Sydney, not later than the 15th of the month previous to issue. Alteration of dates should be notified at once.

1946.

Urbenville (S. Stoddart)	April 26, 27
Grafton (C. W. Creighton)	May, 2, 3, 4
Albury Sheep Show (A. G. Young)	August 6, 7
Condobolin (N. J. Hanlin)	August 6, 7
Trundle (W. A. Long)	August 13, 14
Peak Hill (C. McDowall)	August 20, 21
Parkes (L. S. Seaborn)	August 26, 27, 28
Forbes (J. T. Woods)	September 3, 4
Narrandera (T. L. Bull)	September 13, 14
Mangrove Mountain Agricultural Bureau (W. J. Mitchell)	September 28
Albury (A. G. Young)	October 8, 9, 10

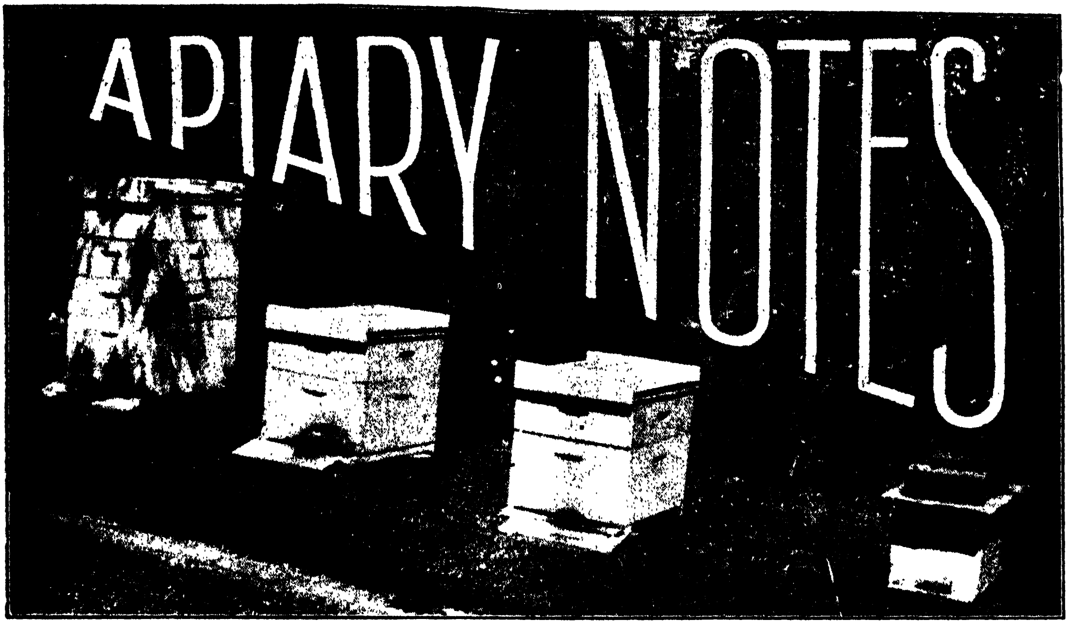
Progressive Farmer Competition Winner.

THE judges in the Progressive Farmer Competition conducted by the Agricultural Bureau of New South Wales in conjunction with the Rural Bank of New South Wales and Broadcasting Station 2GZ, have announced the winner to be Mr. A. K. Gardiner of "Claremont," King's Plains, via Blayney.

Mr. Gardiner will leave during May to travel to the United States of America to live with American farm families in order to study production methods and to establish cultural relations with American farmers engaged in agricultural industries similar to those of this State.

The winner was chosen from among the winners of Agricultural Bureau Divisional competitions, and in his selection consideration was given to practical ability as a farmer, ability for self-expression, public spirit and potential leadership qualities.

Mr. Gardiner should bring back with him much information that will be of great value to the primary producers of this State.



The "Candying" of Honey.

D. MORISON, B.V.Sc., Apiary Branch.

MOST people have observed that some honeys at least, under certain circumstances, undergo a process commonly known as "candying." Some people are also aware that it is possible with many honeys to induce candying by a certain procedure, and that candies vary very much in their physical nature.

The candying of honey is a process of crystallisation which is subject to a number of physical factors. It is of interest to consider the process of crystallisation and the factors which influence the candying of honey, and also to discuss the ways in which candying of honey is induced.

The Composition of Honey.

Before one can understand the candying process, one must consider the composition of honey, for it is one particular sugar component which comprises the crystals which separate out on candying. A knowledge of the variations in composition of different honeys will also help one to understand the different behaviour of different samples of honey under the same set of physical conditions.

The composition of an average American honey has been given* as follows:—

Ingredient.	*Per cent.*
Levulose	41
Dextrose	34
Sucrose	1.9
Ash	.18
Others	3.8

However, marked variations in composition occur.

In a properly ripened honey the percentage of sucrose is negligible, and the only two sugars which need be considered are dextrose and levulose. The candying of honey depends upon the crystallisation of the dextrose, which is the less soluble of the two main sugars in honey. The candying properties of a honey are, therefore, related to its dextrose content.

Crystallisation.

To understand the different candies which occur under different physical conditions, especially that of temperature, the process of crystallisation must first be considered.

Many elements and compounds, on solidifying from a liquid state, or when deposited

* "A.B.C. and X.Y.Z. of Bee Culture" - A. I. Root Co., U.S.A.

from solution, assume a characteristic crystal form.

Let us consider the example of the crystallisation of water. If distilled water be taken and carefully cooled to below O deg. C. in a glass container, it remains a liquid, even though the freezing point of water is O deg. C. Such a liquid is termed supercooled. If, however, this supercooled liquid be given a sharp shock, or crystals of ice or some other substance such as powdered glass be added, ice crystals immediately form and the temperature rises to O deg. C.

If the temperature of a saturated solution of alum in water is lowered, crystals of alum will separate out, owing to the alum being less soluble at a lower temperature, and less of it is, therefore, capable of remaining in solution. If the temperature be lowered suddenly, a large crop of very much smaller crystals is obtained. This is due to the fact that if the alum is deposited very slowly, it tends to accumulate on crystals already in existence, so that large crystals are formed, whereas, on sudden cooling, small crystals are rapidly deposited throughout the solution.

The Induced Candying of Honey.

For some markets, candied honeys are preferred; for instance White Clover honey is often sold in the candied condition. Use is made of the knowledge of the process of crystallisation in producing commercial candies. Honeys from certain species have better candying properties than those from others; *e.g.* Coastal Woollybutt (*Eucalyptus longifolia*) has superior candying properties to Yellow Box, this being due to the different dextrose contents of the honeys.

To produce commercial candies of honey a sample from a species, the honey of which is known to candy readily, is first selected. To this honey, which must be entirely liquid, is then added 5 to 10 per cent. of a very fine grained candy, *i.e.* a candy in which the crystals are very small. This added candied honey is termed "seed" or "starter," and the treated bulk is said to have been "seeded."

This "seeded" honey must be bottled or otherwise placed in the container in which it is to be finally marketed, while in the liquid state, for, once it is candied, it is very difficult to handle and the appearance of the candy is damaged by such handling.

The "seed" is thoroughly mixed into the bulk, which is then placed in containers and the temperature lowered to about 57 deg. Fahr., and candying allowed to take place. This should be complete in a few days with a quick-candying honey.

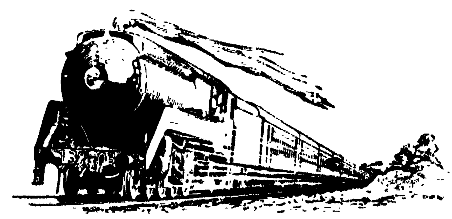
Snow Crystals, Highly Magnified.
[*After Bentley.*

The "seeding" of the bulk provides the dextrose in it with small crystals or foci on which to deposit. This speeds up the process considerably, since the bulk cannot remain supersaturated.

Rapid cooling causes large numbers of small crystals to rapidly deposit, and the resultant candy tends to be uniform and finely grained. If cooling space is not availablt for maintaining a constant temperature of about 57 deg. Fahr., it is obvious that the candying of honey should preferably be undertaken during the winter months.

If natural candying is allowed to proceed in warm weather, its progress is largely

(*Continued on page 222.*)



TRAVEL BY TRAIN

"It must not be imagined that a walking tour, as some would have us fancy, is merely a better or worse way of seeing the country. There are many ways of seeing landscape quite as good; and none more vivid, in spite of canting dilettantes, than from a railway train." So wrote Robert Louis Stevenson many years ago. Since then trains have become safer, faster, and more comfortable. But just as great an improvement on the existing trains will be found in the new trains being built for the New South Wales Government Railways.

New rollingstock to be placed in service includes ten fast diesel trains of light-weight metal, equipped with buffet facilities and air-conditioned. They will be operated where climatic conditions are severe.

In addition, country train services will benefit by the running of fifty new steel corridor carriages. These will be air-conditioned and will incorporate the latest features in rollingstock design.

Four trains, each of seven centre-aisle cars, have been ordered for the service between Sydney and Newcastle. These, too, will be air-conditioned, have buffet facilities, and modern seating accommodation and lighting installations.

When the present passenger locomotive programme has been completed the Department will have thirty express engines (C. 38 Class to you who know your engines) that will be capable of hauling the new trains at speeds up to 70 miles an hour.

Unfortunately "R.L.S." will not see the hills and the valleys, the plains and the beaches of New South Wales through the wide-vision windows of the new trains.

S. R. NICHOLAS,
Secretary for Railways.

The Breaking, Training and Handling of Horses.

Methods Described and Illustrated.

(*Concluded from page 156.*)

T. G. HUNGERFORD, B.V.Sc., H.D.A.

THIS article commenced in May, 1945, and sections of it have appeared in various issues since then. In it the author has dealt with the "breaking" and training of draught, sulky, waggon and saddle horses, with the training and working of broken horses, with the general management of working horses, and finally with methods of restraint.

Throwing or Casting.

Many different methods of throwing or casting are used. The following descriptions relate to methods which involve the use of a rope. When special casting gear, or a casting crush, is available, it will usually be superior. A casting crush is the easiest, quickest and most gentle way of throwing horses for castration or other operations.

Fig. 42.—Sidelines Adjusted Ready for Throwing.

By the Use of Side Lines.

(Fig. 42, 43 and 44.)

A piece of rope 2½ inch external circumference will hold a heavy horse, and 2 inch will suffice for a light horse. The rope will need to be 40 feet long, but preferably 50 feet. Make a loop in the centre of the rope, tied with a figure-of-8 knot. The loop should be just large enough to fit snugly around the base of the neck. Run the rope ends between the fore legs, back around the hind pasterns, and then forward, twisting once round the rope running back. The loose ends are run under the neck loop, one on each side, then one end is taken back and the other run forward (Fig. 42).

Fig. 43.—Throwing with Sidelines.
The horse going down.

A man on the head backs the horse, and two men on each rope take the strain, and the horse is made to sit down as the hind hoofs are pulled right up to the shoulder (Fig. 43). To prevent the neck loop slipping upon the neck as the horse bows his head, and strains with the hind feet, it is absolutely essential to have a

Fig. 44.—A Horse Thrown with Sidelines.
Note the head held well out.

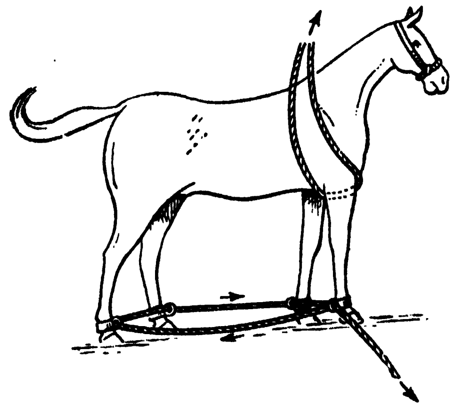


Fig. 45.—Throwing with a Rope and Four Hobbles.
The rope runs freely through the rings bringing all feet together.

rope or surcingle around the chest, which is tied at the top to the top of the neck loop. When the horse is down each free end of the rope is half-hitched over the hind hoof of the same side, one at a time, to secure the horse. Some prefer merely to coil the rope about three times round the fetlock (no half-hitches) and hold it by keeping moderate tension on it.

As the removal of the testicles should occupy less than one minute, a competent operator who has confidence in his throwers can dispense with all tying up (hitching or coiling), as long as his throwers remain opposite one another with the horse between. In this position as they take the strain (during struggling) the horse is not shifted.

In a recent instance a mature but previously unhandled Clydesdale stallion, was thrown with three men on each rope. As he went down two men jumped on his head, and kept the chin extended. With the six men maintaining pressure on the ropes, and without bothering to tie the front legs, the testicles were removed.

Fig. 46.—Hobble Straps on Three Fetlocks with the Off Fore Leg Tied Up

With fewer, or timid helpers, it is, of course, necessary to tie the horse up securely. However, tying up takes time, and increase of the period during which the horse is kept down, increases his exhaustion.

For castrating, the loose end of each rope may be hitched over the pastern of one leg then run between the horse's loin and the ground (the horse is now on his back), the strain taken to spread the leg, and the end hitched over the hoof of the other leg. When both ropes are so treated the legs are spread, clearly exposing the operation field, but as already mentioned this is usually only done in difficult cases or for

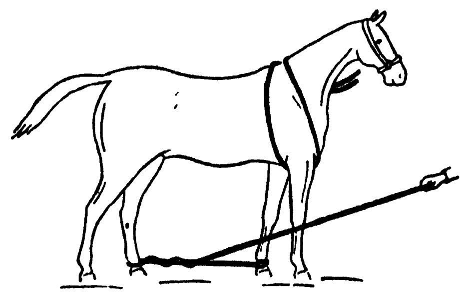


Fig. 47.—Lateral Hog Tying or Parkers' Method.
[*After Miller and Robertson.*

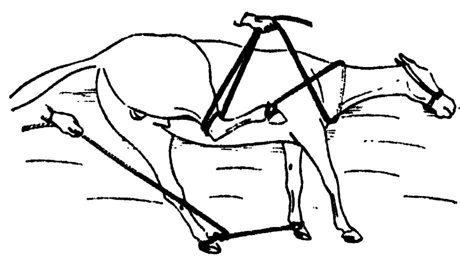


Fig. 48.—Parker's Method—the Horse Down.
The withers rope has been removed and the uppermost hind leg secured.

a clumsy operator. Fussy methods such as elaborate trussing, and propping the horse on his back, ready for castration, are to be discouraged. In uncomplicated cases the horse should be "cut" as and where he goes down, and should then be promptly released, being on his feet again in three to five minutes after casting.

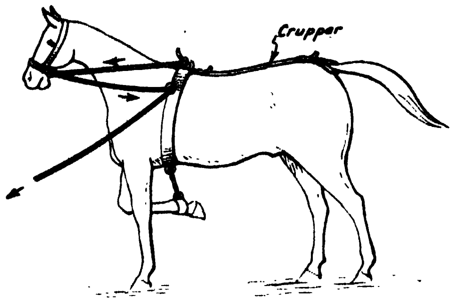


Fig. 49.—An American Method of Throwing.
Sursingle and crupper on, off fore leg tied up and rope in place.

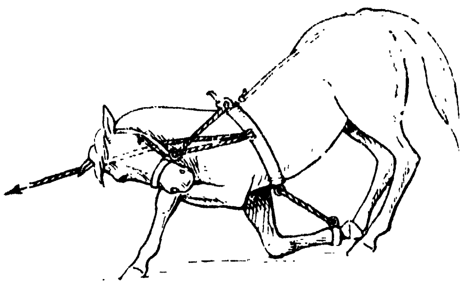


Fig. 50.—Stage Two of American Method.
Head forced to near side and horse down on off knee.

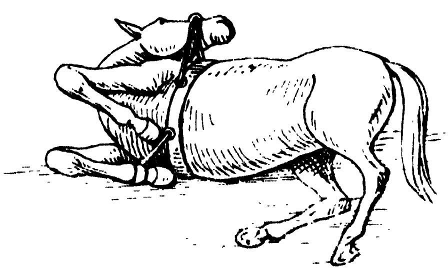


Fig. 51.—Horse Thrown by the American Method.

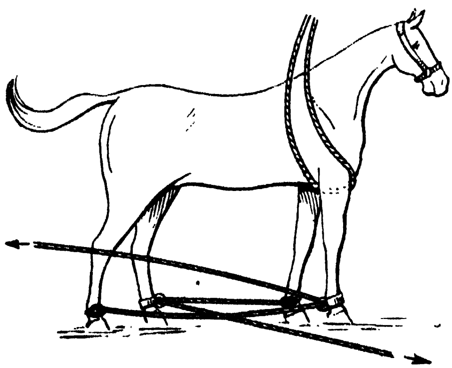


Fig. 52—The Two Hobble, Two Rope Method.
One free end goes forward and one backward.

Difficulties and Dangers.—A young horse, with such an amount of rope about him will often plunge about, and kick off or tangle up the ropes, and untangling them in the case of a terrified, vicious, flighty or unhandled Clydesdale colt is a very real difficulty. In placing the ropes on a cow-kicking or unbroken colt, slip the neck loop over the halter shank and work back over the head and neck, and throw the ends through between the forelegs. Take the free ends behind the horse, just touch the fetlock with the rope, and as he lashes out, slip the rope between the hind legs, lift it

Fig. 53. One Method of Throwing with a Single Rope.
The horse sometimes falls heavily.

Fig. 54. The Same Method with Fore Limb Tied Up to Safeguard the Man on the Head.

above hock level, and bring forward again. Cross over itself once, and bring back and through the neck loop. When both ropes are on and the attendants are ready to pull, the rope loop can be edged down to the pastern with a drafting cane, or stick.

Common and serious errors are to have both ropes pulled backwards. In this case the horse is dragged round and round the

Fig. 55.—Horse Thrown by Method Shown in Figs. 53 and 54.

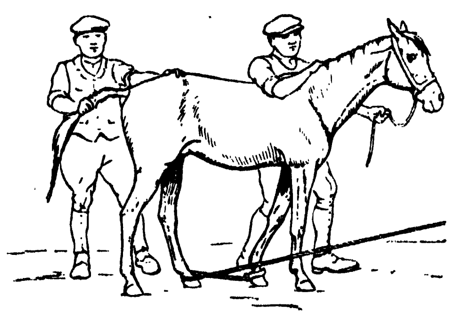


Fig. 56 —Casting with a Single Rope.
The man at the tail pulls the horse over.
After Miller and Robertson.

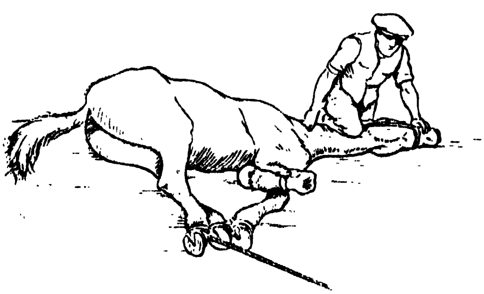


Fig 57 —The Horse Thrown and Three Legs Secured.
This position is not suitable for castration.
[*After Miller and Robertson.*

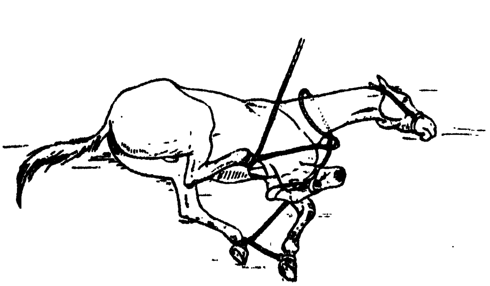


Fig. 58.—Casting with a Single Rope—The Horse Secured for Castration.
[*After Miller and Robertson.*

yard in a confused, struggling heap, and usually succeeds in getting up again if powerful. In one case seen by the author where both ropes were pulled in the same direction (backwards) the horse which was a powerful animal, struggled wildly, and was dragged over a three foot rail fence (sheep yard fence), then finally got up again. Secondly, the neck rope is often not tied to a girth rope and the horse slips the neck rope over the head and leaps up again.

The moment the horse is brought to the ground, the attendant on the head should extend the neck and muzzle (Fig. 44), and keep it extended. Failure to do this is a common fault, which allows the horse extra struggling power, and he may even break his back.

Where an ordinary crush (not one designed for casting) is available, the safest way to throw with sidelines is to place hobble straps (strong) on the hind pasterns, and run the ropes through the ring in these while the horse is still in the crush. With the neck loop held in place by the tie to the girth loop, and the free ends of the lines taken through the exit of the crush, the colt is let out. He rushes madly into the yard, lashing out, rearing and plunging at the feel of the ropes. A swift pull sits him down, and action must be prompt and powerful to secure the head.

In tying up it is quite easy to half-hitch the fore feet to the hind foot of the same side, if the former are in the way, but each added tie results in delay, and the less the delay the better in field operative work.

With a very powerful, and broken or handleable animal, it is an advantage to strap up the foreleg of the side on which the animal is desired to fall. With a mature Clydesdale stallion castrated, say at nine years (*e.g.* for sidebone) such a strap stops the stallion striking at the man on the head as he goes down.

Rope and Four Hobbles.

To use this method pull the feet right together and tie the rope with half-hitches on to the pastern first secured; keep the head well extended (Fig. 45). A method of using hobble straps on three legs with the off fore leg tied up in shown in Fig. 46.

(*Continued on page 222.*)

THE BUFFALO FLY *(Lyperosia exigua).*

A Survey of the Position and a Discussion of Control Measures.*

(Concluded from page 152.)

H. G. Belschner, D.V.Sc., Deputy Chief, Division of Animal Industry.

THE first portion of this article appeared in March issue. In it the author described the fly, recounted the history of its spread in Australia and discussed the economic importance of the pest.

This concluding portion deals with methods of control.

Methods of Control.

Prior to 1942-43, when the buffalo fly reached the east coast of Queensland, the distribution of the fly in Australia was restricted to the northern part devoted to the raising of beef cattle. In these areas the size of the holdings and the infrequency of mustering rendered the application of control measures impossible. Good work was, however, done by the Queensland Department of Agriculture and Stock in retarding progress of the fly by spraying all cattle being railed south or east, and by the issue of regulations controlling the movement of cattle. Double spraying at railhead—one before entrucking and the other in the trucks—with a phenolic medicament has been the usual practice. The aim has been to drive the flies off temporarily and to move the train off quickly, preferably leaving a few unsprayed cattle in the yards as decoys.

Whilst considerable success was achieved by this method of spraying in preventing movement of the buffalo fly by rail whilst the fly was confined to the beef cattle country, it has not been so successful since the fly has reached the Queensland coast, and it can be said that spray plants erected at railheads along the Queensland coast, ahead of the fly, have had little effect in retarding its advance. The main reason for this appears to be the closer cattle population on the coast.

The opinion has been expressed that the travelling of cattle by rail through sheep country, after having been sprayed at railheads, may have contributed largely to the success of this method of control in the past, and that "carry over" flies are probably blown away whilst cattle are travelling in the roofless Queensland cattle trucks.

Possibility of Spraying Cattle on Queensland-N.S.W. Border.

The possibility of spraying railed cattle on the northern border of New South Wales or in close proximity thereto (Wallangarra or Tenterfield), with the object perhaps of retarding progress of the fly south by rail, has been enquired into.

The difficulties are considerable, mainly due to the time it takes to load a train of cattle (3 to 4 hours), which would render spraying prior to trucking with the phenolic medicament used in Queensland ineffective, as the flies would be back on the cattle first loaded before the train moved off. Spraying of the cattle in the trucks is impracticable because all New South Wales waggons are covered, thus preventing overhead spraying from a gantry at the side of the railway line, as adopted in Queensland. Further, once the fly reaches the border, it will infest local cattle and pass from property to property—and the more closely settled the district, the more rapidly will the fly spread, subject, of course, to suitable climatic conditions. Therefore, any attempt to treat cattle on rail will only temporarily check its advance.

Control by Means of a Trap.

A trap based on the American Horn Fly trap has been well tested out in Queensland. In a pamphlet prepared by the Council for Scientific and Industrial Research, and issued by the Queensland and New South Wales Departments of Agriculture, a description is given of the construction and use of this trap, which is reported as being effective in keeping the buffalo fly down to

* An address given to the Tabulam branch of the Graziers' Association.

an insignificant level on dairy farms and thus reducing the incidence of sore areas and fly worry.

The trap is built into the fence of the milking yards or other convenient place where the herd may use it instead of a gate as the cattle pass through to and from milking.

Drapings inside the trap brush off the flies, which fly towards the light and are caught in gauze wire trapping boxes arranged on each side of the trap. As the flies usually die in twenty-four hours, it is not necessary to use any spray to destroy them. The traps are automatic in their action and need very little upkeep. These traps have been seen in operation in Northern Queensland, where it was observed that dairy cattle pass through them without any trouble. On one dairy farm visited, the trap had been found to reduce the fly infestation on the cattle from approximately several hundred flies on the cows and 2,000 flies on the bull to 20 flies per cow and 200 on the bull, per beast per day, after the trap had been in operation three weeks.

The fly population is so great when trapping first commences and there is continual emergence of young flies from the dung, that it takes at least three weeks for the effect of trapping to be shown. Further, it takes about three weeks before the animals are properly trained to go through the trap with all the drapings in place. However, even before all the drapings are in place thousands of flies will be caught daily in the trap. Reports from Council for Scientific and Industrial Research Officers in Queensland state that it is quite common for the fly population to be reduced to a dozen or so flies per cow on dairy farms where traps are in operation.

Whilst these traps are of definite value in protecting the milking cows which pass through them twice to four times a day, a difficulty occurs with dry stock, and also the bull if he is kept separate from the herd. A trap might be placed in a suitable position, such as on the way to water, to deal with dry stock, much depending on the lay-out of the farm.

The cattle must be trained to go through the trap, but this is easily arranged by allowing them to go through the trap for a few days without any drapings, which can be added one by one every day until the animals are quite familiar with them and pass through as they would through an open gateway.

It is obvious that these traps will only be suitable on dairy farms or small fattening properties, or with quiet stud cattle. On larger properties, particularly where numbers of beef cattle are grazed, the traps naturally cannot be used.

Cost of the Traps.

The traps can be obtained for approximately £30 ready built and complete with gauze trapping boxes. The framework can, however, be built more cheaply on the farm and the trapping boxes purchased separately. Demonstration traps may be seen at Wollongbar and Grafton Experiment Farms and on the property of Mr. A. C. Pratt at Tweed Heads.

A New Type of Trap.

Quite recently information has come to hand from the Council for Scientific and Industrial Research concerning a new type of trap which has been evolved and tested out with satisfactory results. In place of the gauze trapping boxes, glass is used and glass is also incorporated in the roof. A 4 to 5 per cent. solution of D.D.T. in power kerosene is sprayed on to the inside of the glass of the passageway and roof. When the kerosene has evaporated, a second coat is applied to ensure a more even and heavy deposit. About a pint of solution will coat the glass with sufficient D.D.T. to last two months. The flies are brushed off in the usual way by the drapings, but instead of being caught in the gauze boxes, merely buzz around on the glass and so acquire a lethal dose of D.D.T.

Use of D.D.T. (dichloro-diphenyl-trichlorethane).

The following statement concerning the use of D.D.T. for this purpose is based on information given in a circular issued by the Council for Scientific and Industrial Research.

D.D.T. is a highly persistent contact poison, not a repellent. Flies that rest for even a short time on the skin of cattle treated with this material eventually die, but they

do so slowly. This action may continue for weeks after application of D.D.T., and any flies alighting on the cattle during this period will be killed.

As the buffalo flies move rapidly from place to place on the body of the beast, it is not necessary to spray the animal all over, as the flies eventually alight on areas that have been sprayed. It is desirable to spray those parts of the body that are especially favoured by the flies, such as the shoulders and flanks.

Control may be effected if only half of the cattle in a herd are sprayed, because the flies move from one beast to another and so, sooner or later settle on treated hair.

Toxicity of D.D.T.

D.D.T. is a poison and must be handled with care. The question of the possible toxicity to cattle is still under investigation, but there is reason to believe that it is not more dangerous than other insecticides, such as arsenical dips. The main points to be observed when using D.D.T. for spraying cattle are:—

1. To avoid as far as possible allowing solutions or emulsions to come in contact with the skin.

2. After spraying, wash the hands or any other contaminated parts of the body thoroughly.

3. Be particularly careful not to allow stock solutions to come in contact with the skin.

4. When spraying cows in the bails, see that nc D.D.T. is transferred to the milk. This can best be achieved by keeping milk buckets well away from the mist when spraying and by ensuring that the udder does not become contaminated by the material.

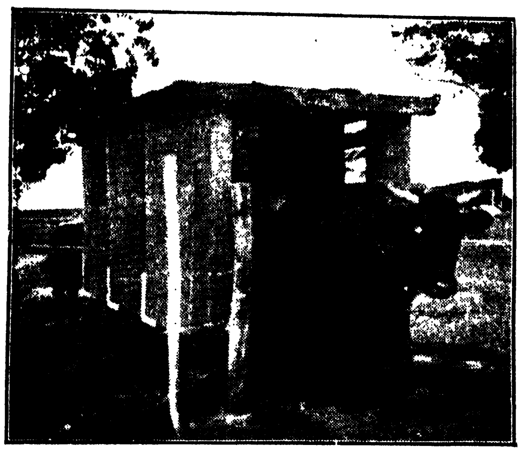
Use of D.D.T. Spray on Dairy Cattle.

Whilst the buffalo fly can be kept well under control by the use of the traps already described, nevertheless it may be necessary to supplement these traps by the use of D.D.T. sprays on cattle that are not running with the milking herd. Further, if for any reason buffalo fly traps cannot be used, the periodical use of D.D.T. sprays may be substituted.

According to the circumstances, the D.D.T. may be applied in emulsions or solutions.

D.D.T. Emulsions.

When the object is to protect the cattle as long as possible, D.D.T. emulsions should be used. It has been found in the experiment work carried out by the Council for Scientific and Industrial Research that emulsions containing 4 per cent. D.D.T., when applied at the rate of 1 gallon to eighty head of cattle will kill all flies that alight on the cattle for a period of about *two weeks,* after which the toxicity falls off rapidly. The cows should be treated again after the fly population begins to build up. The cows may be treated in the bails or in a crush using a *powerful continuous spray hand atomiser.* Small household type sprays are not suitable and will rust rapidly if emulsions are used in them.



Cattle Passing Through Buffalo Fly Trap (Home Made to Official Specifications) in Queensland.

An area of the skin about 18 inches in length, and extending down both sides for about 12 inches from the withers, should be saturated with the spray.

Experiments carried out with many different emulsions suggest good results can be obtained with any emulsion containing 4 per cent. D.D.T., but care must be taken to use a solvent that is not harmful to cattle. Unfortunately, many good solvents of D.D.T. when placed on the skin of cattle cause severe irritation or even burning. The following are examples of simple, readily-prepared, emulsions that in tests have pro-

duced little or no irritation on the skin of cattle:—

(*a*) D.D.T. (90 per cent. pure) 1 lb.
Eucalyptus dives oil (type) 3½ pints.
"Wetsit" .... ¼ pint.
Water to make 2½ gallons of emulsion.

(*b*) D.D.T. (90 per cent. pure) 1 lb.
Solvent naptha (boiling range 90°-190°C.) 5 pints.
"Wetsit" .... ½ pint.
Water to make 2½ gallons of emulsion.

(*c*) D.D.T. (90 per cent. pure) 1 lb.
Power kerosene .... 1 gallon.
"Wetsit" .... ¾ pint.
Water to make 2½ gallons of emulsion.

"Wetsit" is an emulsifier and wetting agent. Doubtless there are others which would prove effective. It is mentioned because it happens to be the one with which the Council for Scientific and Industrial Research investigators have had most experience.

To Prepare the Emulsion.

First make a stock solution by dissolving the D.D.T. in the solvent (eucalyptus oil, solvent naptha or power kerosene), and then adding the "Wetsit." This stock solution is a clear, stable solution which can be stored for long periods without deterioration.

The emulsion is made by first adding to the stock solution an approximately equal quantity of water whilst stirring vigorously until a uniformly milky fluid is obtained, and then adding the remaining water while still stirring to give the proportions according to the formulae.

It is recommended that only sufficient emulsion for immediate use should be prepared. The emulsion should not be stored, only the stock solution.

D.D.T. Solutions.

The Council for Scientific and Industrial Research reports that good control has been obtained by using solutions of 4 per cent. D.D.T. in power kerosene (1 lb. of D.D.T. in power kerosene to make 2½ gallons of spray) and applying this as a fine mist to infested cattle in the bails.

Two pints of this solution are said to be sufficient to protect a herd of thirty cows for more than a month. The solution should be stored in glass vessels.

This method has the advantage of simplicity and cheapness, but the persistency of the toxic effects to flies is said to be not as great as with the emulsions, for far less D.D.T. is applied to the animals. Consequently the cattle may have to be sprayed more frequently. There is also more danger of contaminating the milk.

As kerosene is harmful if applied directly to the skin of cattle, the atomiser used should produce a fine mist that will not penetrate the skin but merely leave a light deposit on the surface of the coat. For this purpose, the ordinary household pusher type of atomiser is most satisfactory.

Whenever a cow bearing a considerable number of flies is brought into the bails, a few puffs of the spray should be directed on to the beast where the flies cluster most thickly. Generally, this is the shoulders and flanks. All flies caught in the mist of the spray will die. Those that are missed by the spray are killed later when they alight on the treated areas and come in contact with the D.D.T. that has remained sticking to the hair after the evaporation of the kerosene.

By this method it is stated the numbers of flies can be kept down to a very low level. The exact degree of control attained is naturally dependent on the frequency and thoroughness of spraying but, if a few of the most heavily infested cows are sprayed every day or so, the mean number of flies can generally be kept down to less than a dozen.

The initial reduction of a gross infestation requires the spraying of most of the cows, but once the population has been reduced, the amount of spraying required to keep it down is said to be not excessive.

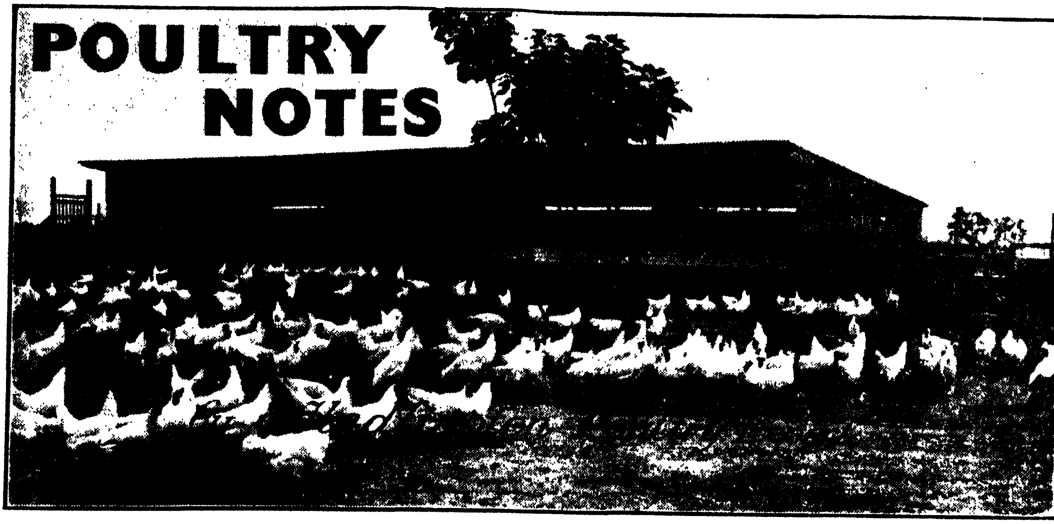
Use of D.D.T. Spray on Beef Cattle.

As beef cattle (and dry dairy cows) are infrequently handled, a single treatment with D.D.T. must be made to last as long as possible.

The 4 per cent. solution of D.D.T. in power kerosene and the method described for its use with milkers is not practicable.

An emulsion is recommended for beef cattle, which should be mustered and

(*Continued on page 218.*)



Caponising Cockerels.

MANY inquiries have recently been received regarding the caponising of cockerels and for the guidance of those contemplating the production of capons for market when conditions permit, or for home use, the main factors involved are discussed below.

In the first place it should be understood that the operation has to be performed at the age of approximately 8 to 10 weeks according to whether the birds are light or heavy breeds, the guiding factor being sexual development, which is mainly indicated by the growth of the comb and whether the birds have commenced to crow or not.

As a general rule birds which have much comb development and are crowing are too far advanced for caponising.

Another aspect which must be considered ed by those who have in mind the production of capons on a commercial scale is that the birds have to be kept until at least 8 to 9 months of age to show any advantage over cockerels as far as size is concerned. This is one of the main drawbacks to the production of capons, as the extra cost of feeding and accommodation necessitates a corresponding high price to show any profit.

However, although the shortage of poultry foodstuffs this year renders impracticable the large scale raising of capons, there appears to be no reason why a payable outlet should not be available for a limited quantity of these birds when the feed situation improves. It would, of course, be necessary to establish a connection with some high-class trade before undertaking the venture in order to ensure a payable return. Under present conditions it is not likely that capons would realise satisfactory prices in the table poultry markets.

It is questionable whether it would be worthwhile caponising cockerels hatched up to June, as early birds can usually be sold when 3 to 4 months of age at high prices, owing to the scarcity of young birds on the market. On the other hand it would be useless to caponise birds hatched after the end of September, as they would take much longer to develop into marketable birds than the earlier cockerels.

Caponising Ducks and Turkeys.

As far as ducks are concerned there would be nothing to gain by caponising, as they are usually at their prime in 12 to 16 weeks, and on account of their heavy food consumption they would not pay to keep for several months longer to increase in size.

The position with regard to turkeys is much the same, and it is doubtful if there would be much demand for larger birds than those now marketed.

Home Production.

In producing capons for home consumption there are some advantages to be gained, inasmuch as it is possible to maintain a supply of table birds throughout the year, if

accommodation is available, without causing any annoyance to neighbours through crowing—and the birds can be kept without any risk of fighting, as they lose all masculine characteristics when caponised. Moreover, they do not become tough with age as do cockerels.

The Operation.

It is important that the birds be starved for at least thirty-six hours before the operation; this results in the emptying of the alimentary tract, leaving more room for working, and causes less obstruction to the vision; and, if water is also withheld during the last twelve hours, there will be less bleeding. During hot weather, however, it would not be advisable to withhold water.

White Leghorns at Suitable Age for Caponising.

Australorps at Suitable Age for Caponising.

The main difficulty would be the cost of having the birds caponised, as there are only a few private veterinary surgeons who undertake this work, and even if the poultry keeper elected to carry out the operation himself, it would be necessary to obtain a set of instruments at a cost of about £2.

With most sets of instruments two pieces of cord are supplied; these are for fastening the birds in position. The end of one cord

should be used to fasten around the legs, and the other end should either be secured to a hook or weight, whilst the second cord is tied around the wings and secured in a similar manner to hold the bird and prevent it from struggling. The bird should be laid on its side on a table or box set at a convenient height for working, and in a position

White Leghorn Capons, Seven Months Old, 5 to 6½ lb. in Weight.

Australorp Capons, Seven Months Old, Weighing 6½ to 8½ lb.

where the sunlight will shine directly on it, free from any shadow of the operator; or, if being done by artificial light, a lamp of high candle-power is necessary.

The instruments should be laid out in a handy position, with a sponge and cold water close handy. Upon securing the bird on the table a few feathers should be plucked off near the front of the hip joint, leaving a clear space of about 1½ inches square, and the part should be wetted with cold water. Using the forefinger, the space between the last two ribs can be located, when the skin should be drawn to one side and the nail of the forefinger pressed between the ribs as a guide for inserting the blade of the knife. A clear cut of about 1 inch in length should be made, and the spreader, which is included in the set of instruments, inserted between the ribs to leave an opening through which the operation can be performed. A thin membrane hides the organs from view,

and this has to be torn away with the tearing hook, after which the upper gonad will be visible lying along the vertebrae. The remover should be carefully manipulated around the organ, care being taken not to cut the artery. The gonad is removed by drawing out and twisting the cords.

While it is possible to remove both organs from one side, in many cases it is preferable and safer to perform the operation on both sides. Care is necessary that the whole of each gonad be removed, otherwise the bird will be what is known as a "slip," and will retain all male characteristics. There is no necessity to sew up the wounds, as the incision will close up as soon as the birds are released. It is a good idea for those who have not previously performed the operation to practice on a few dead birds.

After being operated upon, the birds should not be allowed to roost for a few days, nor should they be put together in large numbers, owing to the risk of crowding, not more than about twelve birds being placed in one pen. Drinking water should first be supplied, and soft food given, but only sparingly, for a couple of days, gradually bringing the birds back to their full ration. About a week after the operation the birds should be given free range, and be kept under these conditions until they are ready for market. If desired they may be "topped off" about three weeks prior to marketing by cooping them up and feeding a sloppy mash ration.

Wind Puffs.

Caponised birds frequently develop what are called wind puffs a few days after the operation. This is caused by the air accumulating under the skin, and can easily be remedied by puncturing the skin, preferably with a small X-shaped cut.

Preservation of Fruit Juices.

(*Continued from page* 194.)

parts of the different juices is satisfactory, but the proportions can be varied to suit individual taste.

A blend of equal parts of orange and pulpy apricot juice gives a particularly attractive and tasty juice. Pineapple and orange blends are very useful, as the two flavours blend well together, and there is better preservation of orange flavour than in straight orange juice. An attractive juice is made from two parts of pineapple juice, two parts of orange juice and one part of lemon juice, to which sugar is added at the rate of 1½ lb. per gallon, or about a small cup full to the pint. For use the juice is diluted with one or two parts of water or soda water.

The different blends which contain orange juice should be processed to 200 deg. Fahr. as set out previously for straight orange juice. Heating to 170 deg. Fahr will be satisfactory for the other blends.

The Buffalo Fly (*Lyperosia exigua*).

(*Continued from page* 214.)

sprayed in a crush over an area of several square feet on the shoulders. Mustering for dipping provides a convenient opportunity for spraying cattle with D.D.T. After passing through the arsenical dip and being allowed to drain, the cattle may be crushed and sprayed. Strong continuous-spray hand atomisers or a knapsack spray may be used.

D.D.T. Emulsions in Dipping Vats.

The use of D.D.T. emulsions in dipping vats is not recommended because the emulsions break down in the bath. This means that a large quantity of D.D.T. left after dipping a mob of cattle will almost certainly be lost.

Further the quantity of solvent necessary for charging a dipping vat is very great. For example, in order to charge a 2,000 gallon dipping vat with a 2 per cent. D.D.T. emulsion, about 400 gallons of kerosene would be required.

It will, therefore, be seen that until such time as more suitable D.D.T. preparations are evolved for use in a dipping vat, the dipping of cattle for both ticks and buffalo fly infestation cannot be economically carried out.

FEEDING NOTES.

Contributed by The Division of Animal Industry.

VITAMINS FOR BETTER PIG LITTERS.

THE results of attention to the vitamin intake of brood sows before farrowing are—

Less services per sow.
Less dead pigs at farrowing.
Higher weaning percentages.
Higher weaning weights.
Higher growth rates after weaning.

Feeds such as grains, mill offals, meat meal and oil meals are all relatively low in the "B" group vitamin, and, except yellow maize, contain practically no vitamin A. These "B" group vitamins and vitamin A are essential for fertility, and rearability of litters.

How can adequate intake of these vitamins be assured?

Sufficient vitamin A can be obtained from—

- 2 lb. of good, leafy, green feed per sow per day.
- 1 tablespoonful of vitamin A-rich fish liver oil or ½ lb. of oil freshly mixed with each 100 lb. of crushed grain.
- 10 lb. of good, green lucerne meal per 100 lb. of crushed grain. (This is not a very reliable source as the vitamin A content of lucerne meal varies a great deal.)

Sufficient "B" Group vitamins can be obtained from—

- 2 lb. of good, leafy green feed per sow per day.
- 10 lb. of lucerne meal or good green leafy lucerne chaff per 100 lb. of crushed grain.
- ¾ gallon of skim milk or buttermilk per sow per day.
- 8 lb. skim milk or buttermilk powder, or liver meal per 100 lb. of crushed grain.

Leafy green feed is the cheapest form in which to supply vitamins, but where this is unobtainable, fish liver oils with lucerne meal, or good, leafy lucerne chaff is just as good.

In some American experiments, sows fed throughout pregnancy on a ration of grain, soybean meal, fish meal, meat meal, and minerals, supplemented with cod liver oil to supply vitamin A, weaned only 10 per cent. of their litters. When this ration was supplemented with lucerne meal, 85 per cent. of the litters were weaned.

**Supply Green Feed to Sows—
It Pays!**

Riboflavin and Manganese Supplements for High Wheat Poultry Rations.

G. L. McCLYMONT, B.V.Sc., and L. HART, B.V.Sc., Veterinary Research Officers.

THE recent necessity of feeding a high proportion of wheatmeal in poultry rations resulted in complaints from hatcherymen that hatching percentages were being considerably impaired. It appeared probable that nutritional deficiencies, caused by substituting wheat and wheatmeal for bran and pollard, were the cause of the trouble, although it was recognised that shortage of green feed or insufficient or excess meatmeal may also have been involved.

Accordingly an experiment* was designed and carried out, in which different types of high wheatmeal rations were fed to breeding stock. Hatchability results were compared with those obtained from a ration which contained a high proportion of bran and pollard, such as is commonly fed to breeding stock with good results. The purpose of this article is to provide hatcherymen with the information from the experiment which will be of value in their hatching operations.

* Carried out under the direction of the Poultry Nutrition Sub-committee (Mr. W. L. Hindmarsh, Director of Veterinary Research; Dr. H. G. Belschner, Deputy Chief; Messrs. G. L. McClymont and L. Hart, Veterinary Research Officers; E. Hadlington, Poultry Expert; and D. C. Duncan, Officer-in-Charge, Poultry Experiment Farm, Seven Hills).

The rations and results are shown in the table on page 221.

The appearance of the dead embryos in the low hatchability groups indicated deficiency of riboflavin (one of the B group vitamins), and manganese (a mineral element). Supplements of both these materials were added to the rations giving low hatchability,† with the result that the hatchability was restored to a level equal to that obtained from the bran and pollard rations.

PRACTICAL APPLICATION OF THE RESULTS.

Riboflavin Deficiency.

Breeding fowls need about 2.5 parts of riboflavin per million parts of feed for maximum hatchability. (Parts per million is the same as micrograms per gram).

The riboflavin content of common feeds is as follows:—

Feed.	Riboflavin. Parts per million.
Wheat, oats, maize, grain sorghum...	0·8 to 1·2
Bran and pollard	2·0 to 3·0
Meatmeal	5
Oil meals (peanut, linseed, coconut) ..	1·5 to 2·5
Buttermilk, skim milk or whey powder and liver meal	20 to 30
Lucerne meal	14
Green feed	4 (3 lb. green feed is, because of its high water content, equivalent to only 1 lb. of dry feed).
Synthetic riboflavin	1,000,000

It is evident that rations containing a high proportion of grain or crushed grains, such as wheat and wheatmeal, are likely to be too low in riboflavin to allow maximum hatchability. Supplementing breeding rations with feeds rich in riboflavin such as buttermilk, skim milk or whey powder, liver powder, liver meal or synthetic riboflavin, is indicated.

Green feed is a very good source of riboflavin, but there is an indication from the experiment that even with all the green feed the hens could eat in two hours (2 oz. per day), the green feed did not supply quite enough riboflavin to supplement the low riboflavin rations.

† NOTE.—There is no evidence that riboflavin or manganese supplements are warranted for egg production rations. Requirements of both these nutrients for egg production are ever much less than for hatchability.

Lucerne meal is a very good source of riboflavin, and 10 per cent. of lucerne meal in the mash, with as much green feed as birds could eat, would probably supply sufficient riboflavin for supplementing low riboflavin rations.

The amount of buttermilk, skim milk or whey powder, liver meal, lucerne meal, or synthetic riboflavin to add to a ration cannot be stated with any exactness; it will depend on the composition of the rations, especially the proportion of bran and pollard, amount of green feed, and so on. However, an average mash-grain ration should not require more than say, 5 per cent. of dairy by-products or liver meal, or 10 per cent. lucerne meal in the mash, with green feed, to provide enough riboflavin.

Hatching percentages and appearance of dead embryos are probably the best guide. Hatchability of at least 75 to 80 per cent. should be obtained with a complete ration and satisfactory hatching procedure, and there should be no evidence of "clubbed down."

Supplies of milk powders and liver meal are rarely equal to the demand, so that hatcherymen should endeavour through the year to obtain supplies of these materials before the hatching season. Supplies of synthetic riboflavin are not at present plentiful.

Where synthetic riboflavin is to be used, mix the riboflavin with ground limestone and a little feed and add the mixture to the ration at the rate of 3 grams of riboflavin per ton of mash on a mash-grain ration or 1½ grams per ton on all mash ration. Avoid exposing the riboflavin to sunlight or strong light.

Evidence of Riboflavin Deficiency.—Eggs which fail to hatch because of riboflavin deficiency can usually be picked on the appearance of the embryos, which are affected by a condition known as "clubbed down." The down fails to pierce the skin, and the skin is covered by small, white pimples instead of normal down. Eventually the down grows out with small, "clubbed" ends. Only a proportion of the embryos show these abnormalities.

Manganese Deficiency.

Breeding hens require about 30-50 parts of manganese per million parts of feed for maximum hatchability. Requirements depend on the strain and breed of fowl, and the amount of mineral matter in the feed. The average manganese content of common feeds is as follows, but the range is large, as shown for wheat.

	Manganese Parts per Million.
Wheat and oats	14-37 —average 31.
Wheat bran	110
Wheat pollard	100
Maize	5
Meatmeal	20
Linseed meal	37
Green feed	25 (on dry matter basis)
Rice bran	250
Buttermilk powder	0·5

It can be seen that rations low in bran and pollard are likely to be deficient in manganese for maximum hatchability, and supplementing of all breeding rations except those containing a high proportion of bran and pollard is probably worthwhile.

High manganese feeds such as rice bran can be used, but it is probably more satisfactory and practicable to use a manganese supplement, such as manganese sulphate. This material can be obtained very cheaply, and is added to the feed at the rate of ¼ lb. per ton of feed. The easiest method of adding manganese to a ration is by finely powdering and mixing the material at the rate of 1 lb. of manganese sulphate per 40 lb. of salt, where the salt is being used as 1-1½ per cent. of the mash on a mash-grain ration, or 1 lb. of manganese sulphate to 60 lb. of salt, where the salt is being used as ½-¾ per cent. on an all-mash ration.

SUMMARY of Wheatmeal Hatchability Experiment.

	Ration A.	Ration B.	Ration C.	Ration D.
Composition of Rations—				
Bran	30	...	...	
Pollard	61½	...	...	
Wheatmeal	...	79	84½	
Meatmeal	7	3	14	Same as " B " only green feed instead of fish oil
Peanut meal	...	6	...	
Coconut meal	...	5	...	
Linseed meal	...	3	...	
Bone meal	...	1½	...	
Salt	1½	1½	1½	
Fish oil	...	1	...	
Protein Content of Mash	20 per cent. With whole wheat grain and green feed.	19.4 per cent. With whole wheat grain and *no* green feed.	22 per cent. With whole wheat grain and green feed.	19.4 per cent. With whole wheat grain and green feed.
Hatching percentage before supplementing	80 per cent.	44 per cent.	58 per cent.	74 per cent.
* Hatching percentage after supplementing Rations B, C and D with riboflavin and manganese salts	75 per cent.	74 per cent.	71 per cent.	82 per cent.

* The fall from 80 to 75 per cent. on Ration A is of no significance. The increased percentage after supplementing Rations B, C and D show improvement in hatchability.

The results of the hatchability experiments during 1945 do not allow a definite statement that manganese deficiency was affecting hatchability, as both riboflavin and manganese were added together, but the evidence is fairly strong. Supplementing low mill offal breeding rations with manganese sulphate is recommended until further research enables more specific recommendations.

Manganese deficiency affecting hatchability may be suspected when embryos dead in the shell appear undersized and the beak is parrot-like in conformation.

Summary.

Rations with a high proportion of wheat and/or wheatmeal, with large or small amounts of meatmeal and with or without green feed need supplementing with riboflavin-rich feeds and manganese to obtain good hatchability. Rations with a high proportion of bran and pollard do not appear to need such supplements.

Acknowledgment.

The statistical analysis of this trial was carried out by Mr. F. C. McCleery, B.Sc. Agr., Biometrician.

The "Candying" of Honey.

(*Continued from page* 206).

dependent on temperature and is more gradual. Crystals formed are larger and may vary in size. If candying is very gradual, strata of different-sized crystals may be formed in the honey. The honey may commence to candy and then either wholly or partially re-liquefy if a warmer spell of weather occurs.

In any event the marketing of candied honey, especially if sold in block form, should only be undertaken in the winter, for the candy is liable to re-liquefy in summer temperatures (usually partially) with consequent damage to its appearance.

Many beekeepers make a practice of re-using tins which have previously contained honey, without first removing all traces of that honey. Under these circumstances honey may be placed in tins with crystals of sugar (dextrose) on the sides and bottom. If the temperature is low enough, these crystals will immediately initiate candying, and the crystals formed are liable to be large and undesirable.

The Breaking, Training and Handling of Horses.

(*Continued from page* 210).

Lateral Hog Tying or Parker's Method.

This is shown in Figs. 47 and 48. The rope over the withers is used to pull the horse off his balance.

The American Method.

The gear in this instance may be rope or a special surcingle and crupper may be made (see Figs. 49, 50 and 51). The off fore leg is tied up, the head is flexed to the near side and the horse goes down on his off knee.

Two Hobble, Two Rope Method (European).

This is illustrated in Fig. 52. Note that the free end of one rope is taken forward and the other backward. Pull the feet of each side well together, and half-hitch the free ends of the ropes on to the feet originally secured. The free ends of the rope may then be run between the animal's loins and the ground, and secured to the opposite pair after taking the strain. This spreads the legs.

Casting with a Single Rope.

Figs. 53 to 58 illustrate methods of casting a horse with a single rope.

General Precautions.

The horse should be starved, for twelve hours if possible, before casting, as a full abdominal cavity may lead to injury if the animal falls heavily. In all cases the horse should be compelled to extend the head, the muzzle being forced out in a straight line with the neck, as this minimises struggling and the danger of a broken back. Soft ground, thick grass or a bed of some material such as sawdust should form an ideal site for casting.

Acknowledgments.

It is desired to acknowledge many suggestions and criticisms from various practical horse men. In particular the helpful suggestions of Captain Charles and Sergeants Gould and Shepherd of the 3rd A.A. Horse Transport Company, are gratefully acknowledged.

(*Concluded.*)

Tubercle-free Herds.

THE following herds have been declared free of tuberculosis in accordance with the requirements of the scheme of certifying herds tubercle-free, and, unless otherwise declared, this certification remains in force until the date shown in respect of each herd :—

Owner and Address.	Number Tested.	Expiry Date.
Registered Stud Herds.		
Bathurst Experiment Farm (Guernseys)	28	12/10/46.
Berry Training Farm, Berry (A.I.S.)	129	16/10/46.
H. F. Bradley, "Nardoo," Ashford Road, Inverell (Jerseys)	40	13/4/47.
L. W. Campbell, "Dunmallard," Fern Hill Road, Inverell (Jerseys)	39	21/7/47.
E. J. Cattell, "Kapunda," Rob Roy, Inverell (Jerseys)	121	30/6/47.
E. Chegwidden, "Austral Park," Berry (Jerseys)	88	14/1/47.
Christian Bros., Novitiate, Mt. St. Joseph, Minto	25	11/9/46.
B. N. Coote, Auburn Vale Road, Inverell (Jerseys)	85	23/7/47.
Cowra Experiment Farm (Ayrshires)	53	9/7/46.
Department of Education, Yanco Agricultural High School (Jerseys)	64	1/3/47.
R. C. Dixon, Elwatan, Castle Hill (Jerseys)	29	5/3/47.
Farm Home for Boys, Mittagong (A.I.S.)	31	24/7/46.
Farrer Memorial Agricultural High School, Nemingha (A.I.S.)	44	28/8/47.
N. L. Forster, Abington, Armidale (Aberdeen-Angus)	164	19/5/46.
Forster and Sons, Abington, Armidale (Jerseys)	86	19/5/46.
A. D. Frater, King's Plain Road, Inverell (Guernseys)	107	11/4/47.
W. G. A. & F. J. Frendenstein, "Chippendale," Grenfell Road, Young (Beef Shorthorns)	47	15/1/47.
Grafton Experiment Farm (A.I.S. and Aberdeen-Angus)	249	30/7/46.
Hawkesbury Agricultural College, Richmond (Jerseys)	82	19/3/46.
Hurlstone Agricultural High School, Glenfield (Ayrshires)	52	21/7/46.
Kahlua Pastoral Co., "Kahlua," Coolac (Aberdeen-Angus)	257	30/11/47.
E. L. Killen, "Pine Park," Mumbil (Beef Shorthorns)	261	25/9/46.
G. Knight, Tannabah, Coonabarabran	60	30/11/46.
Lidcombe State Hospital and Home (Friesian)	111	3/10/46
Limond Bros., Morisset (Ayrshires)	62	28/1/46.
McGarvie Smith Animal Husbandry Farm, Liverpool (Jerseys)	72	22/2/47.
W. W. Martin, "Narooma," Urana Road, Wagga (Jerseys)	160	11/7/46.
Navua Stud Farm, Grose Wold, via Richmond (Jerseys)	120	8/10/47.
New England Experiment Farm, Glen Innes (Jerseys)	32	6/3/46.
G. H. Newnan, "Bunnigalore," Belanglo (Jerseys)	38	2/12/46.
Peel River Land and Mineral Co., Tamworth (Poll Shorthorns)	110	16/10/46.
C. A. Penney, "Bringa," Dapto (Guernsey and A.I.S.)	97	8/3/46.
W. R. Raper, Calool, Culcairn (Beef Shorthorns)	86	7/3/46.
D. B. Reid, "Evandale," Sutton Forest (Aberdeen-Angus)	61	23/11/47.
Riverina Welfare Farm, Yanco (Jerseys)	130	26/6/46.
F. S. Simpson "Gunnawarra," Gulargambone (Beef Shorthorns)	167	19/11/47.
Trangie Experiment Farm, Trangie (Aberdeen-Angus)	155	11/3/47.
Wagga Experiment Farm (Jerseys)	15	1/2/47.
H. F. White, Bald Blair, Guyra (Aberdeen-Angus)	300	20/4/47.
Wollongbar Experiment Farm (Jerseys)	97	1/3/46.
Woomargama Estate, Hume (Beef Shorthorns)	206	7/3/46.
A. Young, "Daylesford," Cudal (Beef Shorthorns)	27	3/1/46.
Herds Other than Registered Stud Herds.		
114 A.G.H., Kenmore	70	6/6/46.
Aboriginal Station, Brewarrina	14	20/5/46.
Aboriginal Station, Wallaga Lake	19	29/2/46.
Australian Missionary College, Cooranbong	100	30/8/47.
Barnardo Farm School, Mowbray Park	45	25/5/46.
Brookfield Afforestation Camp, Mannus	203	3/5/46.
N. Cameron, Montrose, Armidale (Late New England Girls' School)	33	20/2/47.
A. N. De Fraine, Reservoir Hill, Inverell	21	8/6/47.
Department of Education, Gosford Farm Home	37	26/2/47.
Ehsman Bros., Inverell	31	22/8/46.
Emu Plains Prison Farm	115	29 1/47.
Fairbridge Farm School, Molong	25	15/4/46.
F. J. Foy, The Valley Farm, Megalong Valley	25	18/12/47.
W. J. Frizelle, Rosenstein Dairy, Inverell	134	16/8/47.
Goulburn District Hospital	5	6/11/46.
A. Hannaford, Braidwood	10	7/2/46.
F. C. Harcombe, Hillcrest Farm, Warialda Road, Inverell	53	10/4/47.
F. W. Hunt, Spencers Gully	27	16/2/47.
Koyong School, Moss Vale	2	5/3/46.
J. H. Lott, "Bellevue," Rob Roy, Inverell	41	26/6/47.
Lunacy Department, Callan Park Mental Hospital	34	21/4/46.
Lunacy Department, Gladesville Mental Hospital	20	15/4/46.
Lunacy Department, Morisset Mental Hospital	79	8/3/47.
Lunacy Department, Parramatta Mental Hospital	62	26/7/47.
Lunacy Department, Rydalmere Mental Hospital	57	30/10/46.
J. O. McGufficke, "Lovely Bank," Rob Roy, Inverell	33	25/6/47.
R. G. P. McLane, Ibis Valley, Swanbrook	36	29/5/46.
S. W. Morris, "Dunreath," Swanbrook Rd., Inverell	43	8/6/46.
J. A. Murray, "The Willows," Keiraville	21	8/8/46.
New England University College, Armidale	19	1/5/47.
Orange Mental Hospital	61	21/2/46.
Parker Bros., Hampton Court Dairy, Inverell	125	25/8/47.
Peat and Milson Islands Mental Hospital	25	6/9/46.
G. T. Reid, "Narrengullen," Yass	167	14/7/46.
C. E. D. Richardson, Kayuga Road, Muswellbrook	101	3/7/46.
V. J. Rolfe, "Mount View," Inverell	18	9/2/47.
St. John's College, Armidale	11	20/2/47.
St. Michael's Orphanage, Baulkham Hills	26	1/6/46.
St. Patrick's Orphanage, Armidale	10	15/11/46.
St. Vincent's Boys' Home, Westmead	37	3/7/46.
State Penitentiary, Long Bay	13	30/11/47
W. J. Stephenson, "Hill View," Fig Tree	53	1/4/47.
The Sydney Church of England Grammar School, Moss Vale	48	18/12/47.
J. M. Turnbull, "Pastime," Kayuga Road, Muswellbrook	85	20/3/47.
A. B. Weidman, No. 2 Dairy, Aberdeen Road, Muswellbrook	68	3/9/46.
A. B. Weidman, No. 3 Dairy, Kayuga Rd., Muswellbrook	38	6/9/46.
A. B. Weidman, No. 4 Dairy, Kayuga Rd., Muswellbrook	57	2/11/46.
T. J. Wilks, "Oaks Farm," Muswellbrook	27	27/6/46.
A. G. Wilson, "Blytheswood," Exeter	57	6/6/46.
C. Wilton, Bligh Street, Muswellbrook	54	12/5/46.
Youth Welfare Association of Australia	142	19/3/46.

Tubercle-free Areas.

The following Areas have been declared tubercle-free and no cattle are allowed to be kept therein unless subjected to the tuberculin test and found free from tuberculosis :—

Bombala Area.
Inverell Area.
Braidwood Area.
Municipality of Muswellbrook.
Municipality of Queanbeyan.

MAX HENRY, Chief of Division of Animal Industry.

Brucellosis-free Herd Scheme (Swine).

THE following is a list of the names and addresses of owners of herds which have been declared brucellosis-free in accordance with the requirements of the Brucellosis-free Herd Scheme (Swine). The work in connection with this scheme has been undertaken as part of the general campaign against this disease and should perform a valuable service to the industry generally. Owing to the limitations of staff it will not be possible for the Department to undertake the testing of herds in general for this purpose, and in future only herds belonging to Government institutions, registered stud herds, or those containing a preponderance of registered stud animals, will be accepted for inclusion in the list. A charge will be made for the work, since the inclusion of a herd in this list should be of benefit to the owner. After a herd has been accredited, two semi-annual tests will be required, and thereafter annual tests, provided that the conditions outlined in the agreement form are strictly adhered to and that negative results are obtained at each test. So far as the elimination of the disease is concerned, apart from placing the herd on the accredited list, this work will continue as at present.

Registered Stud Herds.

Bathurst Experiment Farm, Bathurst.
Campbell, D., "Hillangrove," Wamberal via Gosford
Cocks, F. D., "Condalarra," Goolagong.
Cowra Experiment Farm, Cowra.
Croft, F., Lugwardine, Kentucky.
Draper, R. E., "Glengar," Capertee.
Farrer Memorial Agricultural High School, Nemingha.
Foley, J. B., Gundurimba Road, Loftville, via Lismore.
Garrison Battalion (2nd), Manly.
Gladesville Mental Hospital.
Government Agricultural Training Farm, Scheyville.
Grafton Experiment Farm, Grafton.
Harris, K. H., Pennant Stud Piggery, Purchase Road, West Pennant Hills.
Hawkesbury Agricultural College, Richmond.
Holland, A. L., Argonne, Tubbul.
Hurlstone Agricultural High School, Glenfield.
Maybin, N. C., Towac, Orange.
New England Experiment Farm, Glen Innes.
Newington State Hospital and Home, Newington.
Ricketts, C. C., "Mangus," Young.
Riverina Welfare Farm, Yanco.
Rydalmere Mental Hospital.
Shirley, G. F., "Camelot," Penrith.
Upston, H. E., Wattle Tree Road, Holgate via Gosford.
Wagga Experiment Farm, Wagga.
Waterfall Sanatorium, Waterfall.
White, A. N., Blakeney Stud, Orange.
Williams, G. R. B., "Gwandalan," Grenfell.
Wollongbar Experiment Farm, Wollongbar.
Yanco Agricultural High School.

Herds Other than Registered Stud Herds.

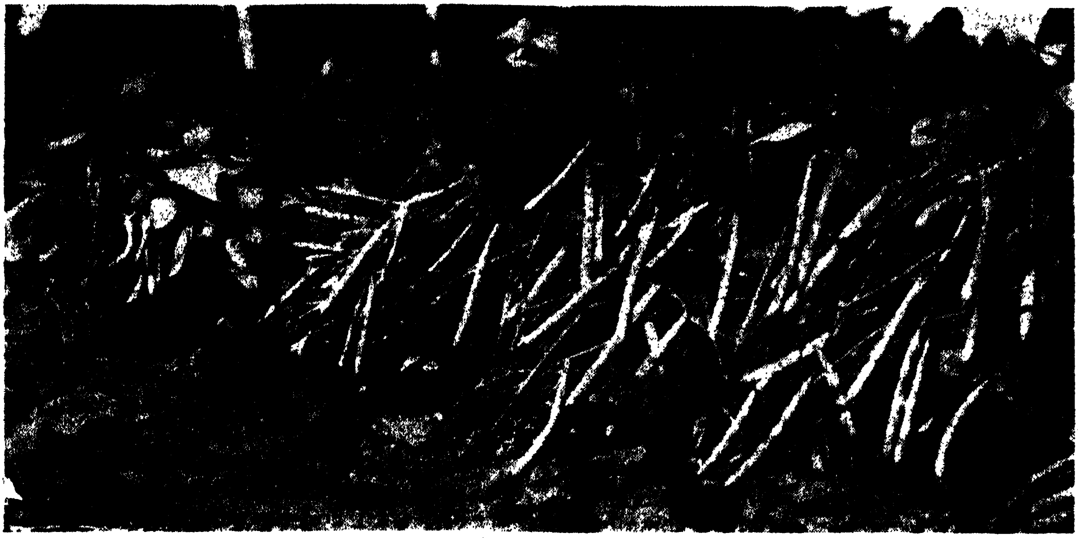
A.G.H. (114 Australia).
Bathurst Gaol, Bathurst.
Brookfield Afforestation Camp, Mannus.
Callan Park Mental Hospital, Callan Park, Rozelle.
Emu Plains Prison Farm.
Glen Innes Prison Camp, Glen Innes.
Gosford Farm Home for Boys, Gosford.
Goulburn Reformatory, Goulburn.
Higgins J. P., "Koranga," Camden.
Lidcombe State Hospital.
Morisset Mental Hospital, Morisset.
Orange Mental Hospital.
Parramatta Gaol, Parramatta.
Parramatta Mental Hospital.
Peat and Milson Islands Mental Hospital Hawkesbury River.

Abortion-free Herds.

THE following herds have been declared free of contagious abortion (Bang's disease) in accordance with the requirements of the scheme of certifying herds abortion-free:—

Owner and Address.	Number in herd.
Registered Stud Herds.	
Armstrong, K. A., "Heathfield," Boorowa	23
Bathurst Experiment Farm (Guernseys)	28
Cowra Experiment Farm (Ayrshires)	71
Department of Education—Farm Home for Boys, Mittagong (A.I.S.)	52
Dixson, R. C., "Elwatan," Castle Hill (Jerseys)	29
Fairbairn & Co., C. P., Woomargama (Beef Shorthorns)	98
Farrer Memorial Agricultural High School, Nemingha (A.I.S.)	44
Forster and Sons, Abington, Armidale (Jerseys)	59
Forster, N. L., Abington, Armidale (Aberdeen-Angus)	179
Hann, O., Chatsworth Road, St. Marys (Jerseys)	14
Hann, O., "Bomerah," Barrington (Jerseys)	42
Hawkesbury Agricultural College, Richmond (Jerseys)	96
Hill, E. Pritchard, Bowling Alley Pt. (Jerseys)	96
Hordern, E. D., Cabramatta (A.I.S.)	95
Hurlstone Agricultural High School, Glenfield (Ayrshires)	33
McEachern, H., Tarcutta (Red Poll)	61
McSweeney, W. J., "The Rivers," Canowindra (Beef Shorthorns)	76
Martin Bros., "Narooma," Urana-road, Wagga (Jerseys)	160
Navua Stud Farm, Grose Wold, via Richmond (Jerseys)	120
New England Experiment Farm, Glen Innes (Jerseys)	32
Peel River Land & Mineral Co., Tamworth (Poll Shorthorns)	86
Riverina Welfare Farm, Yanco	135
Simpson, F. S., "Gunnawarra," Gulargambone (Beef Shorthorns)	150
Training Farm, Berry	118
Trangie Experiment Farm, Trangie (Aberdeen-Angus)	148
Wagga Experiment Farm, Wagga (Jerseys)	25
Walker, Jas. R., "Strathdoon," Wolseley Park (Red Polls)	42
White, F. J., and Sons, Bald Blair, Guyra (Aberdeen-Angus)	263
Whitelaw, L. A., "Wendouree," Merriwa (Beef Shorthorns)	79
Wollongbar Experiment Farm (Guernseys)	110
Young, A., "Daylesford," Cudal (Polled Beef Shorthorns)	27
Herds Other than Registered Stud Herds.	
A. G. H. (114th Australia)	66
Callan Park Mental Hospital	44
Department of Education—Farm Home for Boys, Gosford	37
Fairbridge Farm School, Molong	89
Morisset Mental Hospital	79
New England University College, Armidale	19
Orange Mental Hospital	61
Parramatta Mental Hospital	30
Peat & Milson Islands Mental Hospital	25
Royal Prince Alfred Hospital, Camperdown: "Yaralla" Herd	94
Rydalmere Mental Hospital, Rydalmere	57
Salway, A. E., Cobargo	87

MAX HENRY, Chief of Division of Animal Industry.



Tweed Wonder Beans at Tumbi Umbi.

The Agricultural Gazette.

MAY, 1946.

Post-war Trends in—
VEGETABLE PRODUCTION.

NO agricultural industry in Australia was more greatly influenced by war conditions than vegetable production. Discussing this fact with Agricultural Bureau members recently, Mr. A. C. Orman, Senior Agricultural Instructor, set out the trends in the vegetable production industry which may follow as the result of these influences.

Because of the vast quantities of vegetables in various forms—fresh, canned, dehydrated, quick frozen—required for the Services, it was necessary rapidly to expand production far beyond the peace time level, and this was possible only by mechanising the industry to a degree never previously contemplated. The trend was towards large scale production, and new districts became thriving vegetable growing centres. Machinery new to the industry in Australia was introduced for preparing the land and sowing, transplanting, cultivating and harvesting crops. Factories were enlarged and new ones constructed to cope with the huge quantity of processed vegetables required. New kinds and varieties had to be grown to meet specific demands and contract growers received a guaranteed price for vegetables of a specified quality. Thus the war revolutionised the industry almost overnight, and production was doubled by 1945.

With the conclusion of the war and the approach of consumption to the normal level, it was necessary to make some adjustments in order to provide a measure of stability in the industry. "It is extremely likely" said Mr. Orman "that many of the growers who undertook production during the war and who purchased expensive equipment will remain in the industry, perhaps not as full time growers, but as growers of side crops in a mixed farming proposition. Vegetables such as tomatoes, pumpkins, cabbages and carrots are likely to be the chief ones involved. This trend will undoubtedly increase the difficulties of the established commercial growers, and greater competition will be the outcome.

"The war has taught Australians the value of canned foods. It is evident that consumers are becoming more favourably disposed to canned vegetables, and it is only a matter of time when a wide range of canned vegetable products will be available to the public—canned peas, stringless beans, asparagus, sweet corn and tomatoes, will no doubt be the most popular.

"Quick freezing is a new development in this country and one which appears to have

a future, so far as vegetables are concerned. This process has aroused considerable interest, and we may anticipate the sale of certain vegetables in the frozen pack before long.

"Now, these sudden developments, no matter how desirable they may be, all tend to upset the balance of the industry, and may ultimately necessitate the grower adjusting his cropping programme accordingly."

"What then of the future?

"Vegetable growing is and always has been highly competitive, and it is an industry in which efficiency is all important, but it is my conviction that success in the future will depend upon individual efficiency more than ever before. The production of high quality vegetables may be accomplished only by a high degree of efficiency in all phases of the work—utilisation of naturally fertile soil, good soil management, use of high quality seed of suitable varieties, effective control of diseases and insect pests, cropping only areas that can be efficiently handled and marketing of the produce to best advantage.

"Marketing is one aspect which is frequently neglected by growers" continued Mr. Orman. "How often do we find growers paying careful attention to all phases of production, yet completely ignoring the important matter of marketing? The market price is, after all, a reflection of the grower's work in the field, but unless the produce is carefully graded, attractively packed and wisely marketed, it is not a true reflection. The keen grower will, I think, be compelled in the end through competition to pack his produce in accordance with self imposed grading standards, thus gaining a reputation for quality.

"Other factors which have a bearing on quality, and yet are beyond the control of the grower are transport and storage. Refrigerated transport and increased cold storage facilities would, I am certain, be a real contribution to the improvement of the quality of the vegetables supplied to the consumer, particularly in our cities and large towns.

"Quality as it refers to vegetables is a wide term and includes culinary quality, perhaps the least considered by the grower—and for that matter the consumer. Culinary quality has been by-passed by the industry, it having been subordinated to appearance by the consumer and to yield by the grower. Fortunately the war has, to a degree, focussed attention on some vegetable varieties of excellent quality, and it is to be hoped that the demand for vegetables of a high culinary quality increases, even should it be necessary to pay growers a higher price.

"The Department of Agriculture will be resuming its programme of vegetable improvement work in the very near future, and culinary quality will be one of the many aspects which will receive attention."

Grasshopper Warning—Pest Reported from Many Districts.

A WARNING has been issued to farmers by the Minister for Agriculture (Hon. E. H. Graham, M.L.A.) to be on the lookout for grasshopper swarms which are likely to damage autumn and spring crops.

Reports have been received by the Chief Entomologist, said Mr. Graham, that winged forms of the pest (the Australian Plague Locust) were present in most parts of the western half of the Central Division of the State from the Queensland to the Victorian border. In many localities extensive egg-laying had been observed. It was expected that most of the eggs would remain unhatched in the soil during the winter, and if conditions in the spring were favourable for hatching, a major infestation of grasshoppers was likely and extensive damage to crops and pastures would result. It was possible, also, that some of the grasshoppers now maturing might last long enough to cause damage to young wheat crops in the autumn.

Mr. Graham emphasised the need for every landholder to be ready now and in the spring to take whatever steps were necessary to deal with the grasshoppers before any extensive damage was done.

Landholders were also reminded that control of grasshoppers was compulsory under the Noxious Insects Destruction Act. It was the duty of Pastures Protection Boards, which are charged with the administration of the Act, said Mr. Graham, to see that the provisions of the Act were complied with and the necessary organisation set up to enable landholders to put control measures into operation as soon as they became necessary and certainly before crops and pastures were damaged by the pest.

The Menace of—

FIELD BIND WEED

(*Convolvulus arvensis* L.)

Spreading in Many Districts.

Infested Holdings Rapidly Depreciate.

A. PEARSON, H.D.A., Weeds Officer.

FIELD BIND WEED ("Wild Morning Glory") is causing increasing concern in very many districts of the State as a pest in market gardens and orchards, on irrigation areas, on rich alluvial flats and even wheat areas. On the Murrumbidgee Irrigation Area about sixty holdings (mainly orchards and vineyards) are infested.

That bind weed is U.S.A.'s number one weed pest should be sufficient warning to landholders not to treat the appearance of this weed lightly.

To date, recommendations of control have been based on overseas experience, but it is now planned to carry out experiments in this State; control with chemicals, cultivation methods and competing pastures will be tested.

Bind weed is a perennial plant and stores large food reserves in the roots which travel deeply in the soil. The leaves are alternate and heart-shaped and tend to become arrow-shaped on the top of the vine. The flowers are generally white but sometimes take a pink tinge and are about 1 inch in diameter.

If allowed to develop unchecked field bind weed crowds out most other plants and spreads quickly over cultivation lands. The plant, besides spreading on the surface of the soil, also shoots from underground roots and increases in area by this means.

Control by the Use of Chemicals.

Bind weed can be killed by very heavy applications of coarse salt or by spraying with sodium chlorate. The plant appears to be salt tolerant, and as a result, when using salt to kill the weed, it is necessary to apply at the rate of 1 lb. per square foot—approximately 20 ton per acre. Treatment with salt, except for small patches, is, of course, entirely impractical because of the cost involved. In addition, such treatment sterilises the soil for a number of years so that no other plant growth can be expected to appear. When using salt, it is necessary to treat an area of non-infested land surrounding the weed as the plant will endeavour to survive by sending shoots up from the roots outside the treated area.

The application of sodium chlorate will kill bind weed, but considerably larger quantities are required than for most other perennial weeds. Where it is desired to apply sodium chlorate in a dry form, it is necessary to use it at the rate of at least 600 lb. per acre. Sodium chlorate is, of course, usually applied in liquid form, and it is suggested that any patches of bind weed

Field Bind Weed or Wild Morning Glory.

it is desired to treat with sodium chlorate should be sprayed at the rate of 300 gallons per acre with a solution of 2 lb. of sodium chlorate to 1 gallon of water. The application should be made during the growing period of the plant.

Attempts have been made to kill bind weed by covering it with paper, boards, stable manure, straw, etc. Such methods have generally proved ineffective and thus cannot be recommended.

The Use of Competing Pastures.

On land that is suitable for such treatment, bind weed areas can be turned to profitable use by planting competing pastures such as lucerne and Subterranean clover. On badly-infested areas, both of these plants will be difficult to establish and probably for the first two years will be severely affected by the competition from the bind weed. Ample fertiliser and systematic renovation, besides judicious grazing, are essential if bind weed areas are to be converted to profitable pasture, even in districts very suitable to the pastures.

Control by Cultivation.

The method of control most commonly adopted in America is to kill the bind weed by cultivation. Any perennial plant, when the top growth is cut off, draws on the root system for food to re-establish itself. It must have a certain period of growth above the ground before it can replace the food reserves that have been taken from the roots.

American experiments and experience indicate that bind weed draws on the root system until it has about eight day's growth above the ground. It is then able to start to replace any losses the roots may have incurred. If bind weed is cut off below the ground level and then permitted to grow until it has one week's growth above the ground level, and it is then again cut off below the ground, the root system is weakened. A continuation of this treatment eventually leads to the killing of the bind weed roots and the total eradication of the plant.

Eradiation by cultivation can be commenced at any time during the growing period of the plant. It is necessary to use tyned cultivators with at least 3 inch overlap between the duckfoots, and to see that the duckfoots tynes are in good order and as sharp as possible. Cultivating without a good overlap and sharp points will simply mean distribution of the bind weed roots.

In killing bind weed by cultivation, the land should be worked at a depth of from 3 to 5 inches and cultivation carried out sufficiently frequently to ensure that not more than one week's growth is permitted above the ground. During the greater portion of the first summer of operations, this will possibly mean cultivating about once every two weeks if growing conditions are favourable. As the bind weed becomes weaker, fresh growth is slower in appearing and thus the time between cultivations lengthens.

Once a programme of eradication of bind weed by cultivation has been commenced, it is essential that cultivations be carried out at the correct times, as otherwise the roots will be given the opportunity to build back the food reserves which have been taken from them by the earlier cultivations. It can be expected that it will take about two years' work to kill bind weed by cultivation and that probably from fifteen to twenty cultivations will be necessary. The deeper the cultivations are carried out the less frequent they will require to be. To carry out this number of cultivations is certainly a big task, but bind weed is very persistent, and unless it is controlled the value of infested land depreciates very markedly.

The method of killing by cultivation can be adopted in the treatment of small areas —by the use of a hoe. If the work is done thoroughly and regularly, about twelve hoeings at the correct times should result in the elimination of the weed.

Do Not Neglect This Weed.

The treatments outlined in this article are those that have been adopted with success on a large scale in other countries. Until such time as other methods are known and have been successfully tried in New South Wales, it is suggested that persons with land infested with this weed should follow such of the methods described above as are most suitable to their own particular property.

Bind weed is not a plant to be neglected—it seeds freely, spreads rapidly, is a strong competitor against established crops and will depreciate the value of any holding upon which it becomes established.

INSECTICIDAL CONTROL OF POTATO MOTH.

Promising Results with D.D.T.*

Recent Experiments Surveyed.

N. C. LLOYD, B.Sc.Agr., Entomologist.

DURING the past three years, experiments have been carried out by the writer with a view to achieving control of Potato Moth (*Gnorimoschema operculella*) by means of insecticides.

This article presents a summary of the results of these experiments, and discusses the general question of insecticidal control.

All potato growers are familiar with the small, grey, moth and its caterpillars which, when fully grown, are ½ inch in length and pinkish-grey in colour. The caterpillars mine in the leaves and sometimes in the stems, and may eventually cause the death of the plant, though this foliage attack is rarely serious from the viewpoint of reduction in yield. When the foliage becomes unattractive, the pest turns its attention to the tubers, which by then have swollen and may be cracking the surface of the soil, thus allowing egg-laying moths to gain access to them. In extreme cases, 75 per cent. of the tubers may be infested in the soil.

The aim of insecticidal control may be stated thus:—The elimination of the pest in the foliage during the early part of the season, so that during the period later in the season when the tubers are maturing there will be very few, if any, moths present to infest them.

In all the experiments summarised below, the treated experiment patches were not hilled or irrigated. The variety used throughout was Factor.

Experiments with Derris.

Experiments in 1942 and 1943 indicated that derris, used either as a dust or a spray, was the best insecticide then available. Some experiments were therefore carried out at Bathurst, Millthorpe and Grafton, using derris on a field scale by means of power machinery. Areas of about one acre each were used. The composition of the dust was: derris 1 part by weight, kaolin 4 parts by weight; and of the spray: derris 3 lb., soap 3 lb. to 100 gallons of water.

These experiments showed that, while breeding in the foliage could be very greatly reduced, a corresponding degree of control in the tubers could not be obtained. For this there were two main causes, viz.:—

(1) The capacity of moths to migrate or to be carried by wind from an untreated area to an area which is being treated. This is a factor which greatly complicates the problem of insecticidal control. It is obviously of no use to prevent breeding in a patch if there is a continual influx of moths from neighbouring patches. It is necessary to have any such untreated patches at least four hundred yards away to minimise this migration risk, and this is difficult in a potato growing district.

The presence of volunteer plants and self-sown crops (which persist in potato land for years, and which can harbour the pest) makes this isolation more difficult to achieve.

(2) Potato moth is a pest which must be virtually eliminated in a crop before adequate control in the tubers can be obtained, in the absence of special cultural methods. Although a very large reduction in the foliage infestation can be obtained with derris, this material still permits a certain amount of breeding to go on, with the result that sufficient moths are present at the conclusion of the growing season to infest a large proportion of tubers exposed to infestation.

The Use of D.D.T.

In the spring of 1944 D.D.T. was first used in small-scale, replicated-plot experi-

* Dichloro-diphenyl-trichlorethane.

ments, and gave such promising results that it was decided to investigate its possibilities further. In subsequent experiments it has in all cases proved superior to derris and all other insecticides (including, it may be mentioned, the material known as 666*) in controlling the pest in the foliage. At Millthorpe and at West Maitland last year, it was found possible to eliminate completely all breeding in the foliage within a month after the commencement of applications. In all these experiments the untreated plots were heavily infested. The material was equally effective whether used as 1 per cent. or 2 per cent. dust, or as 0.1 per cent. spray. These results were obtained with knapsack spraying and dusting equipment with which the plants can be uniformly covered with insecticide. With power equipment, it is more difficult to obtain a thorough cover.

D.D.T. was considered so superior to derris, and the supply of it had improved to such an extent, that it was decided last year to use it on a field scale.

Results with D.D.T. on the Coastal Spring Crop, 1945.

D.D.T. was first used on a field scale at Hawkesbury Agricultural College and at West Maitland. It was applied as a 2 per cent. dust, using a dusting machine which will be described later in this article. The D.D.T. used in all these experiments contained 95 per cent. para-para isomer, which is the active constituent of the compound.

Method of Estimating Foliage Injury.—In all experiments, the degree of control in the foliage was determined by estimating the degree of foliage injury by the larvae. This was done by a series of ratings from 0 to 5, according to the amount of injury:—

(0) No Injury.
(1) Very light injury, only a few mines on lower leaves.
(2) Injury easily noticeable—most of lower leaves damaged.
(3) Injury moderate—extending to upper leaves.
(4) Heavy injury.
(5) Plants destroyed by larvae.

In field-scale experiments, fifty plants selected at random throughout the experiment patch were rated, and the same number in any untreated patches which were being used as checks. Ratings were made at intervals during the course of the experiments.

* Benzene hexachloride.

The Hawkesbury College Experiments.

Five applications of dust were made, at intervals of fourteen days. The average rate of dusting was 60 lb. per acre per application, or 300 lb. per acre for the five dustings. Excellent control was obtained, there being almost complete elimination of breeding in the foliage. At the final rating, only two or three larval "mines" were found in fifty plants, while in the untreated patch there were estimated to be over 1,000 "mines" in fifty plants. During the period in which the tubers were liable to be infested, the moth population was very small.

There was a satisfactory degree of isolation, the nearest patch being 800 yards away, and in this patch, both foliage infestation and moth population were very heavy.

The tuber infestation in the treated patch was only 4.2 per cent., and that in the untreated patch 800 yards away only 6.5 per cent. The low infestation in the treated patch was due to the very small moth population. The low infestation in the untreated patch was due to the friable nature of the soil in conjunction with the fact that irrigation kept the ground from cracking.

This experiment was the first one in which an adequate measure of isolation from all other patches was obtained, and the results were very encouraging.

The Experiment at West Maitland.

This was similar to the Hawkesbury one, except that it was quite impossible to achieve any measure of isolation, due to the intensive nature of potato-growing in the Maitland area. Untreated patches were only forty or fifty yards away from the experiment patch, and moths were continually migrating into the latter. Despite this, almost complete elimination of breeding in the foliage was obtained after four dustings with 2 per cent. D.D.T. at an average rate of 46½ lb. per acre. At the final rating, only four or five mines were observed in fifty plants, the average rating being 0.08, whereas in adjacent untreated patches, foliage infestation was very heavy, the average rating being 3.0 and 4.0.

Due to the continual migration of moths into the experiment patch, there were almost as many moths present in the treated as in untreated patches, and therefore equally heavy tuber infestation might have been expected in all patches. However, there was negligible tuber infestation at Maitland last year, even in patches which had not been irrigated. This was due to showery weather filling in the cracks in the soil at the time the tubers were liable to infestation.

New England Experiments, 1946.

Following upon the promise that 2 per cent. D.D.T. dust had given in the field trials in the spring of 1945, it was decided to test it further at Guyra this year, taking care to obtain adequate isolation. These experiments have just been completed, and the results have been very promising from the viewpoint both of foliage control and reduction of tuber infestation.

EXPERIMENT AT LLANGOTHLIN.

An area of one acre, separated by at least 500 yards from the nearest untreated patch, was dusted with 2 per cent. D.D.T. Three applications were made, at an average dusting rate of 60.5 lb. per acre, or 181.5 lb. per acre for the three applications. When the first application was made, infestation of the foliage was considerable, the average rating being 1.20. There was a heavy moth population, and everything pointed to a very considerable infestation.

However, within five weeks, breeding in the patch had been almost completely eliminated, and the average rating decreased to 0.01, whereas in the untreated patches it had increased to between 3.0 and 4.0.

Furthermore, the number of adult moths was very greatly reduced during the time that the tubers were liable to infestation, as compared with untreated patches. For instance, when the experiment patch was dug, there were about fifty moths under fifty plants, whereas in the untreated patches, there were at least 500 moths under fifty plants.

On 3rd April, the experiment patch was dug and twenty-one samples, each of 100 tubers, were taken from different parts of the patch. The average infestation of tubers was 6.5 per cent. However, a large proportion of the infested potatoes were those which had protruded through the ground as early as mid-February, when moths were still abundant in the patch. Such potatoes could easily be detected because they had become greened through exposure, and since these could hardly have been saved by dusting, a fairer estimate of the actual saving given by the dusting is to consider only the ungreened tubers infested. A count of these was made, and it was found that there were only 2.4 per cent. infested.

In two adjacent untreated areas, tuber infestation averaged 33 per cent. and approximately 40 per cent., while the moth population, as mentioned above, was at least ten times as great as in the experiment patch.

The above results are very encouraging. The estimated overall cost of the three dustings was £7 10s., by far the greater part of which was the cost of the D.D.T. The yield averaged 4 tons per acre, and it is estimated that approximately 1 ton per acre was saved by dusting.

EXPERIMENT AT GUYRA.

An area of 1.2 acres was dusted three times with 2 per cent. D.D.T. dust at an average rate of 55 lb. per acre per application.

The experiment was similar in all essentials to that at Llangothlin, and the results were similar. However, there was only some 200 yards separating the patch from the nearest untreated area.

There had been potatoes in the ground the previous year, with the result that there were a number of self-sown plants in the patch. As always happens where potatoes have been grown the year previously, moth infestation became severe very early in the growth of the crop. The average rating was 1.84 when the first dusting was given, while that in a neighbouring untreated area was only 0.35. However, within five weeks, infestation had been so reduced in the treated patch that the average rating was only 0.02, whereas in the nearest untreated area it had increased to 3.5.

The reduction in the number of adult moths was on much the same scale as at Llangothlin. Just before harvesting the experimental patch, fifty plants were examined and there were about fifty moths under them. In the neighbouring untreated patch, the population was at least ten times as great, there being at least ten moths under every plant examined.

The experiment patch was dug on 1st April, 1946, and forty-six samples of 100 tubers each were taken in different portions of the area. It was found that the overall average infestation was 7.8 per cent., which was very low considering the exposed nature of the tubers and the shallow depth at which they were set. However, as at Llangothlin, the majority of infested tubers were those which had protruded through the ground in mid-February, when there was still a heavy moth population. Omitting these, which could not have been saved however successful the treatment, only 2.3 per cent. of tubers were infested.

In a comparable neighbouring untreated patch, the infestation was over 30 per cent. so that, from the viewpoint of reduction of foliage and tuber infestation and of moth population, the treatments were very successful. The estimated cost of the three applications was £7 8s. It was estimated that the dusting saved 1 ton of potatoes per acre.

The Power Equipment Used.

(a) *Dusting Machine.*—The machine used for dusting on a field scale has, throughout, been the Y-2 model manufactured by the Root Co. in U.S.A. and obtained under Lend-Lease. This machine is powered by a 1½ h.p. engine and can dust six rows at a time. The leads are flexible and are attached to an angle-iron boom. They can be adjusted to some extent according to the width between the rows. The machine is capable of dusting 4 acres an hour. For use in the above experiments, it was mounted on a farm dray, which was reasonably satisfactory for the purpose. For use commercially it would have to be mounted on a permanent chassis with wheels adjustable to the width of the rows, and with rubber tyres to facilitate rapid transport between one patch and another. A tractor with a power take-off attachment would be the best means of traction.

(b) *Spraying Machines.*—The Department has not used D.D.T. as a spray on a field scale, but has used derris in this way. In the first spraying experiment at Grafton, an ordinary orchard power spray pump was used, with two long hoses operating on either side. This method was also used at Bathurst the following year. It was found to be hopelessly slow for spraying a crop like potatoes, and at Grafton in 1944 a boom was attached to the orchard pump. The boom permitted six rows to be sprayed at once. Three nozzles per row were used, which gave a very thorough cover of the plants.

At Bathurst in 1945, a spray cart having a power take-off and drawn by a tractor was used. This had only two nozzles per row, and only a 50-gallon capacity.

It is possible with a spray cart of 100 gallons capacity, to spray an acre in approximately 1¼ hours if the water supply is handy or if a water cart is in use to keep the supply up; 180-200 gallons of spray per acre were used in the experiments with derris.

In treating potato crops on a field scale, spraying enables a more thorough cover to be obtained and is more economical of insecticide material than dusting. However, lack of water, plus the slowness of the operation, would seem to prohibit the use of spraying generally.

The Future Prospects for Insecticidal Control.

The latest work has shown that moth population can be reduced to a relatively small figure during the time in which the potatoes are capable of being infested, that is towards the latter end of the season. In these experiments, moth population was considerable before the treatments were commenced, and at Guyra a number of tubers became exposed to infestation very early, before moth could be properly controlled.

In future experiments the aim will be to prevent infestation in the foliage from building up at all. Treatments will commence as soon as the pest appears, to be followed by a further treatment ten to fourteen days later. This programme will be designed to exclude moth from the area for the remainder of the season. For this reason, the area must be removed from all risk of migration.

In this way it is hoped to obtain control with two applications of dust, and, in view of the size of the plants so early in the season, it should be possible to reduce the amount of dust used to 40 lb. per acre. The cost of dusting should then be reduced to little more than £3 per acre, at the present price of D.D.T.

D.D.T. dust at 1 per cent. has given just as good results as 2 per cent. D.D.T. in replicated small plot experiments, and

there is a possibility that it will give just as good field control. If so, the cost for materials would be considerably lessened, and the overall cost of two dustings would be about £2 5s.

There are, however, difficulties in the way of field control by means of insecticides. They are as follows:—

(1) *Cost.*—This is the foremost difficulty, since control must be economic. The programme suggested above should, if successful, prove an economic proposition. Potatoes are a very difficult crop to dust thoroughly with power machinery, without using very large amounts of dust. Full-grown plants cannot, in the writer's opinion, be satisfactorily dusted against potato moth with less than 50 lb. per acre.

(2) *Necessity for Thorough Dusting.* The rows must be spaced uniformly, otherwise the dust will at times be directed on to the ground, not on to the plants. Where there is not perfect uniformity, it is necessary for an operator to be behind the machine to adjust the leads over the rows. Where complete control is aimed at, as with this pest, a thorough cover is essential.

3. *Necessity for Isolation and for Cleaning-up Self-sown Plants.*—Either the patch to be treated must be isolated, or *all* patches in a locality must be dusted. Attention must also be paid to the removal of self-sown plants from previous plantings.

4. *Shortage of Machinery.*—If all patches in a given area are to be treated, a considerable number of machines will be necessary, as all dusting must be done promptly and within a certain period, and cannot be delayed, thus creating a great demand for machinery at the one time.

Acknowledgments.

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Mr. F. McCleery, Biometrician, assisted in the planning and in the interpretation of results, and thanks are also due to Mr. J. B. Noonan, Agricultural Instructor, Glen Innes, for much valuable assistance in carrying out the latest work at Guyra.

Importation of Pedigreed Stock.

Subsidy Scheme Begins 1st May.

THE Minister for Agriculture (Hon. E. H. Graham, M.L.A.) announces that at the recent meeting of the Australian Agricultural Council it was decided to revive and extend the pre-war scheme of assistance to importers of pedigreed stock, such scheme to commence on 1st May, 1946.

It has been decided to include under the scheme, specified classes of stud cattle, sheep, pigs, milch goats and draught horses imported from the British Isles, Canada, and the United States of America.

The Government of New South Wales has agreed to co-operate in the scheme. Cost of subsidising the importations will be shared equally by the Commonwealth Government, Commonwealth Bank, and State Government concerned.

The shipping companies have agreed to carry the stock at reduced rates.

The following rates of subsidy will be paid to importers:—

Cattle	£100 per head.
Draught horses	£100 per head.
Pigs	£50 per head.
Sheep	£40 per head.
Milch goats	£40 per head.

The rates of subsidy will be subject to pro rata reduction in relation to any fall in the costs incidental to importation, and any amended rates will become effective as from the date of such fall.

Applications for permission to import under the scheme must be submitted to the Department of Agriculture on forms which are being provided for the purpose, and the applications will be dealt with in the order of their receipt by the Department, which will notify the applicant when his application is approved. It will be necessary for the applicant to pay the whole of the expenses connected with the purchase and importation of the stock, and to claim on the Department for payment of the subsidy after the animals have been safely landed in the State.

Application forms containing full particulars of the conditions governing the scheme are in course of preparation, and will be available at an early date from the Under Secretary and Director, Department of Agriculture, Box 36A, G.P.O., Sydney.

Seed Wheat and Oats for 1946 Sowing

List of Growers of Approved Seed.

IT has been decided to publish again this year a list of growers of approved seed wheat and oats who have supplies available for sale. The crops of the growers listed were inspected by officers of the Department and reached a standard of purity and trueness to type up to the approved standard.

Growers listed should notify the Department immediately their available seed of any variety is exhausted.

Wheat.

Bencubbin.—
Carney, C., "Maranoa," Ulamambri.
Ward, H. E., "Gwenvale," Parkes.
Harley, H. J., "Wattle Park," Tulligibeal.

Bordan.—
Dunkley, A. D., "Bon Lea," Brundah, via Grenfell.

Ford.—
Hall Bros., "Ellerslie," Wallendbeen.
Fitzgerald, K., Box 294, Griffith.
Robson, C. C., "Norcia," Rivers Road, Canowindra.
McDonald, H. H., "Belmont," Canowindra.

Gular.—
Byrnes, E., "Glen Ayr," Burdett.

Rapier.—
Carney, C., "Maranoa," Ulamambri.
Ward, H. E., "Gwenvale," Parkes.

Oats.

Algerian.—
Wilson, R. & Sons, "Fairview," Oberon.
Dickson, A. S., "Yurunga," Oberon.
Witten, R. A., "Willowbank," Oberon.
Howard, G., "Kallara," Springdale.
Burns, W., Goongirwarrie, Carcoar.

Belar.—
Hall Bros., "Ellerslie," Wallendbeen.
Hill, A. H., "Carawatha," New Molyan, via Mendooran.
Witten, R. A., "Willowbank," Oberon.
Uther, L. F., "Myonah," Cowra.
Ward, H. E., "Gwenvale," Parkes.
Cullen Bros., Bunglegumbie, via Dubbo.
Idiens, H., "Kangarooby," Gooloogong.

Brigalow.—
Wilson, R. & Sons, "Fairview," Oberon.
Gardiner, A. K., Claremont, King's Plain, Blayney.

Fulghum.—
Crick, P., "Mayfair," Gollan.

Kurrajong.—
Ward, H. E., "Gwenvale," Parkes.

Barley.

Abyssinian.—
Idiens, E., "Kangarooby," Gooloogong.

Approved Seed—May, 1946.

To assist in the production and distribution of approved seed of recommended varieties of crops and vegetables, the Department publishes in this list each month the names and addresses of growers of such seed.

***Cauliflower*—**
Shorts—H. Burton Bradley, Sherwood Farm, Moorland.

Varieties of Approved Seed Available.

IN order that farmers may be directed to what are regarded by the Department as the most satisfactory local sources of approved seed of recommended commercial varieties of farm crops and vegetables, the Department is willing to supply information concerning such sources of seed of the following varieties:—

***Tomatoes*—**
Rouge de Marmande, Pearson, Break O'Day, Tatura Dwarf Globe.

PRIOR to the damage caused by floods and frosts in March, there was a chance that the year's production of maize would exceed 3 million bushels, but it may now be as much as ½ million bushels less. Grain quality will also be affected.

Pineapple Growing.

A Means of Diversification of Sub-tropical Fruit Culture.

H. W. EASTWOOD, H.D.A.,
Special Fruit Instructor.

Pineapple Fruiting.

IT becomes evident that there is scope for the immediate expansion of the pineapple industry in New South Wales when it is realised that the essential conditions of topography, soil and climate which suit bananas are also satisfactory for pineapples.

For the past ten years the area under bananas in this State has fluctuated between 15,000 and 22,000 acres, whereas the extraordinary small area of pineapples has never exceeded 250 acres. The habit of North Coast orchardists of concentrating on the production of bananas has been successful since the rehabilitation of that industry in 1928, with one exception—during the glut period of 1936-37. Banana growers then experienced the hardships associated with persistent low prices from over production or under consumption. To continue the practice of specializing in the production of one fruit in the future will ultimately lead to further repetitions of adverse conditions.

Diversified sub-tropical fruit production has much to commend it, and should receive the serious consideration of fruitgrowers in the future. The pineapple is suggested as one of the other tropical fruits that can be successfully grown independently or in conjunction with bananas.

During the past decade a great deal of research work has been carried out on pineapple culture by officers of the Department of Agriculture and Stock, Queensland, which has revolutionized many of the accepted methods of planting, cultivation and fertilizing. The results of these investigations are cited in this article.

Climate.

The commercial areas which make up the small acreage of pineapples in this State are dotted throughout the coastal strip from Tweed Heads to Port Macquarie, with a sea frontage of approximately 250 miles.

Results obtained over a long period of years from these plantations are sufficient proof that the climate and selected soils in this tract of country are suitable for pineapple growing, provided certain precautions are observed. As this plant is a native of tropical America it should not be planted in locations subject to frost or exposed to severe and cold winds. Even continuous low temperatures and prolonged dry spells retard the normal growth and development of this fruit. Marked differences of temperature, more particularly in the winter time, and soil conditions influence the sugar content, and this influence is the more pronounced the further away from the tropics.

A well-distributed, moderate rainfall is preferable to a heavy annual precipitation—especially if of irregular occurrence—and any deficiency in this regard can be improved by good cultural methods and the use of paper mulch. Excessive rainfall contributes to the production of soft, watery, fruit which lacks flavour and does not carry well. It also accentuates drainage problems.

An altitude of up to 800 feet might be considered safe, but this depends on the proximity to the sea and the direction of the slope of the land. Lower altitudes are desirable away from the sea, and a few degrees of adverse slope are equal in effect to several degrees of latitude.

Soil.

Several types of soil are planted to pineapples in this State, ranging from rich, dark-brown, volcanic scrub loams to poor, sandy heath country. Although successful plantations are found on many classes of soils the most essential feature of suitable pineapple soils is good natural drainage. Stagnant water is very injurious to pineapple plants and during periods of excessive rainfall the soil must not become sodden or sour.

A deep, loose, topsoil overlying a friable and porous subsoil is important. If the subsoil is compacted the plantation will not thrive, irrespective of the suitability of the top soil. Naturally well-drained soils are warmer, and vegetation growing on them is less liable to cold injury than where the subsoil is not suitable and the soil thus naturally colder.

A high humus content is also necessary and cultural methods that will maintain the organic matter of the soil should be practised.

In addition to the physical qualities of soils, there is one significant chemical requirement that should not be overlooked, that is a pineapple soil needs to be strongly acid—between pH 4.5 and 5. A neutral soil is expressed as pH 7 by soil chemists; a soil above this figure is alkaline and one below is acid. Thus the application of ordinary agricultural lime to pineapple soils is generally harmful.

When the soil is not sufficiently acid, sulphur can be used to increase the acidity, but before doing so advice should always be obtained—preferably from a soil chemist. Some heavy soils will not respond to any reasonable amount of sulphur, but from 3 to 5 cwt. per acre is usually sufficient for sandy types of soil.

Iron, which is an essential element to the pineapple, is more readily available to the plant in acid soils. If plants are lacking in iron in soils where manganese is present in sufficient quantities to prevent any response to sulphuring, then they should be sprayed regularly with a weak solution (6 lb. to 25 gallons of water) of sulphate of iron. Only a light spraying is given in the form of a very fine mist—and 25 gallons of mixture will be sufficient for an acre.

The ideal soil for pineapples is a loose, friable, deep, well-drained, moisture retaining soil overlying a subsoil of similar nature, with a high humus content and a strongly acid re-action. Probably the best soil type is a deep, free sandy loam.

Site.

To comply with the climatic conditions previously mentioned a site will need to be on undulating or hilly country to get above the frost line and to be protected from southerly and westerly winds. A disadvantage of highlands is that they are seldom level, and although sloping land is well suited to pineapples it is more expensive to work than level ground, and is liable to wash during heavy rains. Shelter from the south and west may consist of higher slopes, a belt of natural timber or selected trees or vegetation planted as a windbreak.

It is preferable to choose a site near rail-head or shipping port. Long haulage is expensive and it does not improve the quality of the fruit, especially when the roads are in bad condition. Pineapples are a bulky crop and handling and local transport should be reduced to a minimum for best results.

Soil Preparation.

The land should be cleared of all timber and stumps, and the soil freed of roots to a depth of at least 15 inches. Avoid fierce fires in clearing.

Although the pineapple is a shallow-rooted plant, it is advisable to plough the land as deeply as it is practicable according to the nature of the soil. It is necessary for the young plants to get a good start by commencing to make roots at once thus becoming quickly established, producing vigorous growth and consequently larger

fruit. The land should, therefore, be worked thoroughly and brought to a good tilth before planting to obtain good results.

As pineapples are planted close together it is essential that the ground should be as free as possible from weeds, besides paspalum, couch and Johnson grasses, etc. Unless the land is clean, the cost of keeping weeds and grasses in check would be considerable, as the work in the vicinity of the plants must be carried out by hand. Initial cultivation can always be carried out in a much more thorough and satisfactory manner than any subsequent working.

Early preparation of the land some weeks before planting will compact the soil, retain any rain that falls and accumulate a good moisture content to give the young plants a start. Sulphuring, if necessary, is done prior to planting by spreading the ground sulphur evenly over the land and lightly harrowing it into the soil.

In laying out a plantation such factors as drainage, prevention of soil erosion and convenience of working should be carefully considered. If all things are equal the rows should run north and south, but the direction of the rows is not as important as providing for good drainage and the prevention of erosion. Steep slopes should be avoided.

Short rows and sufficient tracks make working and harvesting easier. The headlands or roadways should be sufficiently wide for a cart or truck to pass, but should not exceed 10 per cent. of the area. The rows are best run up and down hill, and should lead to cross drains which in turn empty into the main drains running parallel with the rows. Naturally the steeper the slope the shorter the rows and the more cross drains.

Planting Material.

The most popular type of plant used to commence the plantation is a sucker, which shoots from low down on the stem of the parent plant, and in turn produces fruit and more suckers. It is vigorous and commences bearing earlier than other types of planting material, but does not normally produce as good a first crop as either the nib or the top. Large suckers are not as good as medium-sized ones, as they often flower before they are properly established, producing fruit too small to be of any value.

Forward suckers approaching flowering are used when other material is scarce. These are best stripped, dried and planted horizontally like cane sets in shallow furrows and covered with an inch of soil. Clusters of plants will shortly appear above ground and will have to be thinned out.

Shoots that grow from the fruit stalk—known as slips, gill sprouts, nibs or robbers—are preferred by some growers because they produce a better first fruit than the sucker, although they take longer to come into bearing. If these growths are allowed to develop after the fruit has been gathered

A Young Pineapple Plantation.

they form excellent plants, especially in the Smooth-leaf Cayenne variety. This variety does not, as a rule, produce a large number of suckers and slips are used to make up deficiencies and for planting out new areas.

The best slips are those which come singly from the lower part of the fruit stalk, as distinct from those which come in a cluster around the base of the plant, and known as the "collar of slips" type; the latter are very undesirable as means of propagation. The pinelet at the base of slips is always broken off.

Showing the Different Parts of the Plant Used for Propagation.
1. Sucker. 2. Nib. 3. Crown.

The tuft of leaves on the head of the fruit, called the top or crown, is also used but takes at least two years to produce fruit. As the top is marketed with the pine it is difficult to obtain this type of planting material in this State.

Whatever kind of plants are used for propagating purposes, it is of vital importance, that they should be selected from healthy, robust parent plants that have borne a heavy crop of good quality fruit. Off-shoots from first crop plants are best. A grower who selects his planting material for each new planting from his best first crop plants exhibiting early maturity, free suckering, low stature and large, well-shaped fruit, will eventually have a plantation returning him increasing yields per acre. Producing the crops in shorter time will further increase his profits by reducing the cost of production.

The indiscriminate planting of any kind of plants, having no regard for physical defects such as deformities, cripples, barren plants, etc., is encouraging failure. Planting material taken from old, neglected and worn out plantations because of cheapness or convenience, will never be satisfactory.

Plants from wilted parents will always have a tendency to wilt. Careful selection of off-sets will greatly assist in the advancement of any plantation.

If propagating material has to be kept for some weeks before planting it should be placed in a single layer, butts up in the shade in the open. If heaped up they will sweat and rot. Never set them in a nursery bed.

Before planting it is very important to strip off the base leaves and dry the material for several days in the sun to get rid of excess moisture. If the plants are not stripped they will be slow to start growing, and the new roots are liable to twist round and round the base of the plant forming the condition known as "tangle foot." If not dried they are liable to develop disease known as "base rot" and rot in the soil.

When it is necessary to move the plants long distances it is an advantage to cut back the leaves, thus avoiding the smashing of young centre leaves, allowing the plants to be bagged more firmly and consequently reducing the bulk. Cutting back of the leaves is not recommended when plants are obtainable handy to the area it is intended to plant, as the cutting causes the leaves to bleed.

(*To be continued.*)

Control of—

SNAILS ON CITRUS TREES.

P. C. HELY, B.Sc.Agr., H.D.A., Entomologist.

THE common "shell-back" snail becomes, at times, an extremely serious pest of citrus trees, principally orange and grape-fruit. Orchards in low-lying situations, or in the neighbourhood of creeks and swamps, are particularly susceptible to attack and may experience trouble yearly. Heavy autumn rains following drought conditions are always likely to stimulate snail invasions in plague numbers.

During dry weather adult snails congregate and aestivate on the trunks and lower limbs of the trees, but when sufficient rain has fallen they again become active, make their way down to the ground and deposit their eggs in the soil. As snails are hermaphroditic, each individual can lay eggs. The small, whitish, spherical eggs are usually deposited in clusters about one inch below the surface of the soil, and as many as 400 eggs may be deposited by an individual snail. Young snails are soft, fragile creatures which resemble the adults in general form.

During cool showery conditions these young snails move up into the trees and commence to feed on the foliage and fruits. At first they merely rasp the surface tissues, and as they increase in size the damage becomes more deep-seated. The lower portions of the trees around the "skirts" are the most heavily infested but the snails gradually work their way up into the tops.

Ripe and coloured fruits are most attractive to the snails and injury becomes apparent as the fruit commences to colour. On such coloured fruits the snails may eat off small patches of rind, but frequently gouge out holes which extend as far as the flesh of the fruit, although little penetration of this actually occurs. These, more-or-less circular holes may be ¼ to ½ inch in diameter, and completely spoil the fruit for marketing. Even when the surface tissue is only superficially damaged, the injury may prove serious, because such areas are readily invaded by mould spores, particularly during the moist conditions which favour snail activity.

Small, green, second-crop fruits up to about golf-ball size may have superficial patches removed from the skin, and although such injury is not then very noticeable, these fruits when mature present a very unattractive, scabby appearance.

In addition to the fruits, the foliage is extensively damaged, snail-injured leaves being characterised by their ragged, frayed appearance and exposed network of uneaten veins.

Living wood and twigs are not damaged by the snails, but dead branches are readily attacked and the bark almost completely denuded, leaving the white woody tissues exposed in a characteristic manner. Dried oranges on such twigs are also fed on and

Common Shell-back Snails Fastened to the Trunk of an Orange Tree during Dry Weather Conditions.
[*After Basinger.*

the desiccated rind may be completely removed.

Control.

Many different methods of snail control have been recommended, but all are subject to some disadvantages.

Ducks are excellent, but require to be run continuously in comparatively small numbers in the orchard to prevent a build-up of snails. Active breeds such as Khaki Campbells or Indian Runners are required, Muscovy ducks being of no value for snail control. They should be housed in the orchard and fed only sufficiently, and at night, to induce them to return to their quarters. They should then be locked up and released each morning. The hazards of foxes and thieves are generally the greatest deterrent to the use of ducks, particularly in unnetted orchards.

Bran baits are of value for snail control but should only be used when snails are active, as in showery weather, or after ploughing in of weeds and cover crops which may have previously sheltered large numbers of snails. Calcium arsenate at the rate of 1 lb. to 16 lb. of bran is effective, especially when numbers of snails are moving to the trees after a cover crop has been turned over. Once the snails have gained access to the trees the bait must be broadcast over the trees to be effective. However, under conditions of high humidity such baits broadcast over the trees may cause considerable fruit and leaf fall.

Metaldehyde and bran bait may be safely scattered over the trees, but under orchard conditions it is not very effective in reducing snail populations.

Sprays of cryolite, barium fluosilicate and D.D.T. have been tested, but are not effective enough to be of any real value. Nicotine sulphate is toxic to small snails on contact but has little residual effect. Lime-sulphur, as applied for the control of white louse scale in the winter, will kill small snails, but is only of limited value.

Tartar emetic and sugar is stated to be an effective spray for snails, particularly for the young stages, and the following mixture is recommended in California *:

Tartar emetic	1 lb.
Sugar	2 lb.
Water ...	50 gals. (United States).

With any of the effective baits or sprays mentioned above, conditions favourable for snail activity are essential in order to obtain satisfactory results. These conditions obtain during showery weather when spraying cannot be carried out and when water-soluble poisons are likely to be washed off soon after application. Calcium arsenate in bran baits, as previously stated, is also likely to cause injury under such conditions.

Bordeaux mixture, especially if combined with white oil, is the most satisfactory spray so far tested against snails. Young snails are killed readily, and if the bodies of the larger snails are wetted with the spray a satisfactory kill follows.

A combination of Bordeaux mixture, white oil and nicotine sulphate gives a good kill and knockdown in trees heavily snail-infested, and used in conjunction with poison baits or ducks is very effective. The snails remaining alive after the initial spraying are concentrated under the trees where they are readily accessible. A suitable combination spray is:—

Bordeaux mixture	2-2-80
White oil emulsion	1 gal.
Nicotine sulphate	¼ pint.

The important advantage of the Bordeaux mixture spray is its residual effect against snails. In practice, trees sprayed with Bordeaux mixture for the control of fungous diseases are not likely to become snail-infested for several months. This repellent effect has been noted on occasions almost twelve months after spraying.

Hand-collection and destruction of adult snails concentrated on the trunks of the trees during the summer will amply repay the labour involved.

* Persing C. O., *Calif. Citrograph* 29 (3) 60. 1944.

AN announcement by the Chief Secretary, Mr. Baddeley, draws attention to the fact that fires may now be lit in New South Wales for the purpose of clearing land or destroying rubbish or for any similar purpose, provided the person concerned has obtained the necessary permit from the local shire council.

FRUITGROWING

BORON DEFICIENCY IN PEARS.

Symptoms and Control Measures.

S. W. FERGUSON, Fruit Inspector, and
J. A. HOLBECHE, Fruit Instructor.

Pear Tree showing Growth Symptoms of Boron Deficiency.
Note sparse foliage.

IN the Kentucky district tests have shown that many of the disorders in pears which were the cause of serious crop losses, were directly due to a deficiency of boron. Tree growth has also been retarded—seriously in some instances. It was found that borax, when applied as a soil dressing or a spray, gave complete control. After treatment the fruits returned to normal and even severely affected trees responded and commenced to grow vigorously.

The tree and fruit symptoms of boron deficiency in pears and the effects of treatments with borax are described in this article. The data has been collected largely from field observations made in the Kentucky district.

Soil Types at Kentucky.

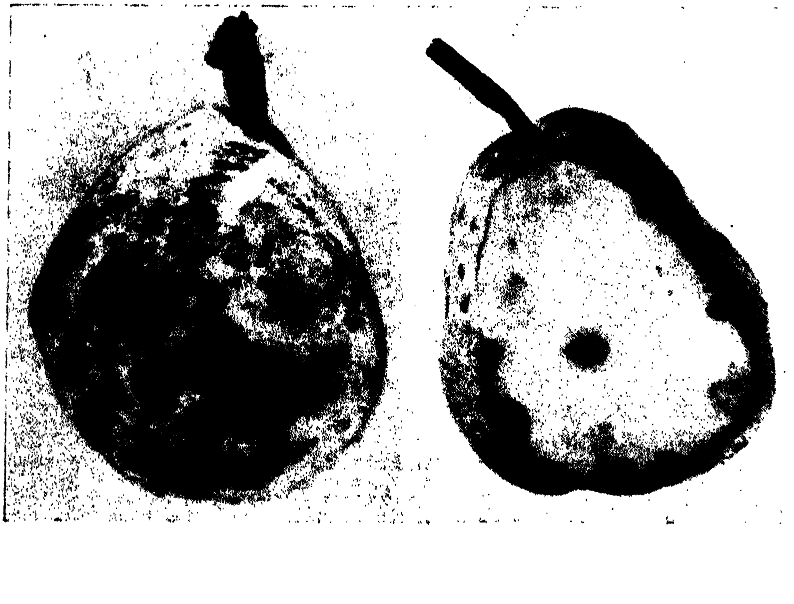
Generally the soils are of a granitic type and range from light to medium heavy loams, the deeper soils usually being confined to the ridges. The subsoils are generally of an undesirable type, almost impervious to water.

Symptoms of Boron Deficiency.

Leaves and Twigs.—Generally the foliage is sparse and trees have an open appearance. On the shallower soils "dieback" in the limbs is prevalent, affected twigs being apparent on trees of all ages.

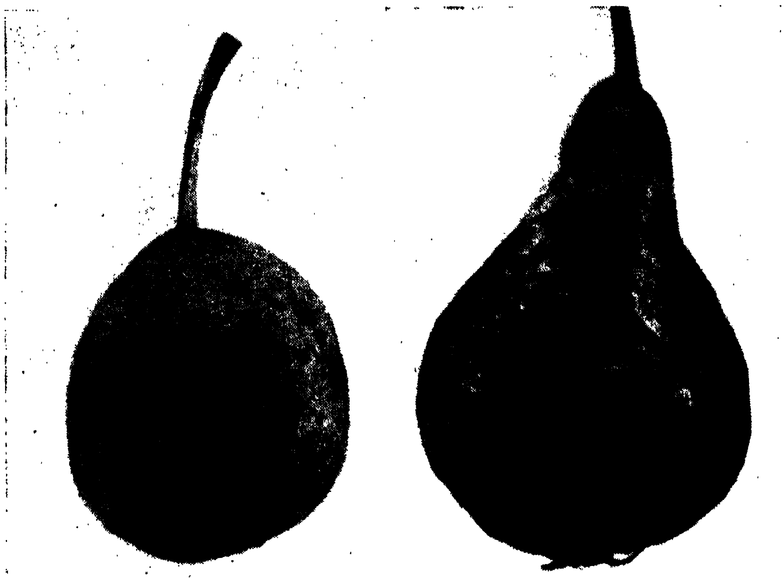
The dieback commences in the spring, when affected buds fail to develop. The leader growths often commence to grow normally, then die back from the tip. The leaves on affected twigs usually become blackened and do not fall readily.

It is typical for new growths to arise from below the dead tips. These, in turn, may



Packhams' Triumph Pears showing Symptoms of Boron Deficiency.
Left.—Surface blotching and cracking and indications of stone cells at at calyx end.
Right.—Corky areas scattered through flesh.

die back from the tip or develop abnormally and form a rosette of leaves. Another abnormal condition which appears to be associated with boron deficiency in pears, particularly the varieties Packham's Triumph, Winter Cole and Winter Nelis, is defective blossom, resulting in poor fruit setting.



Fruit Symptoms of Boron Deficiency in Pears.

Left.—Winter Cole—note groups of cracks.

Right.—Beurre Bosc—note large longitudinal cracks.

Fruit Symptoms of Boron Deficiency in Pears.

Left.—Josephine—note indications of stone cells at calyx end, and groups of cracks.

Right.—Winter Nelis—note typical abrasive skin condition.

Fruits.—Conditions indicating boron deficiency are numerous, but the presence of cracks and blotches on the surface of the fruit is one of the surest indications, when combined with a typical flesh condition. Generally a dry, tough flesh and the presence of stone cells in the fruits, usually at the calyx end, are typical. The flavour of such fruits is also affected and may be described as insipid.

In the Williams variety, early and uneven yellowing of the fruits is often a symptom of boron deficiency. Affected fruits of this variety do not store well, as fruit which is apparently good when packed often proves defective later.

The accompanying photographs show the types of surface blemishes which are typical of those caused by boron deficiency.

Varietal Symptoms.

Packham's Triumph.—Surface blotching and some cracking. Severely affected fruits may fail to develop, become very hard, and

are covered in small cracks. The presence of stone cells at the calyx end of the fruit is most usual in this variety. Corky areas may also be found scattered through the flesh, in which case the skin may also be dull and greasy.

Beurre Bosc.—Usually splits severely in a longitudinal direction. Many smaller splits often radiate from the main one. The whole surface of the pear may be roughened by the presence of large numbers of small cracks.

Winter Cole.—The grouping of numerous small cracks around the fruit, often at the part of greatest circumference, is usual. Severely affected fruits may show great numbers of small to large cracks and become very hard.

Josephine.—Somewhat similar to Winter Cole, but also shows minor stone cells at calyx end.

Winter Nelis.—May sometimes split in a manner similar to Winter Cole. Generally the skin is very rough and takes on a dark-brown colour when mature. The flesh is usually extremely dry, and shrivelling often takes place when fruits are immature.

Williams.—This variety shows no skin abrasions to indicate boron deficiency. The skin colour and flesh flavour of affected fruit, however, show definite symptoms. Generally a poor flavour combined with abnormal yellowing of the fruits is typical.

Observations at Kentucky.

Powdered borax was applied to the soil in a manner similar to that recommended for apples. An amount of 1 lb. per adult tree was applied and then lightly hoed into the soil.

It was found that whereas a winter and early spring application of borax was effective in controlling cork in the current year's apple crop, a much longer period was required to effect a control in pears. Borax applied to trees in the summer and autumn months gave good control during the following season. Trees responded and commenced to grow vigorously in the spring, and the fruits also showed the beneficial effects of the borax, developing quite normally and showing no trace of the deficiency symptoms. Treatment in the winter and early spring months did not give results until the second season.

It was noted that although most areas treated with a soil dressing of borax in 1937 still show no re-appearance of boron deficiency, in odd instances there were signs of trouble again in 1941.

Recommendations.

Soil Dressings.—These are most effective and convenient, and are recommended in preference to spray applications.

Care should be taken to treat pear trees according to their size; an application of borax to small non-bearing trees is not advisable.

Amounts to Apply.

Large trees	1 lb. per tree.
Medium sized trees	½ lb. per tree.
Small bearing trees	¼ lb. per tree.

When to Apply.—Dressing should be applied in the autumn for results the following season.

Method of Applying.—The best method is lightly to chip the borax into the soil after spreading. Care should be taken to avoid any action which will result in bringing the borax into direct contact with the tree roots.

When to Repeat the Application.—It can be expected that effective control will be obtained from a soil dressing of borax for a period of at least three to five years. No further dressings should be applied until some evidence of the re-appearance of cork is observed.

Spray Applications.—Sprays were not tested in the earlier work at Kentucky, but over a wide area of the State these have proved to be effective. Concentrations used vary from 0.25 per cent. (2½ lb. borax to 100 gallons water) to 0.1 per cent. (1 lb. borax to 100 gallons of water) solution. This spray may be combined with the usual arsenate of lead or lime sulphur sprays.

When to Apply.—A borax spray combined with arsenate of lead and applied at the calyx stage is recommended. The borax may also be applied with the first cover spray.

Method of Applying.—It is essential that the spray be thoroughly applied so that all parts of the tree are covered.

When to Repeat the Application.—Sprays should be applied each year.

Removal of Arsenical Residue from Apples.

Experiments at Bathurst Experiment Farm.

J. D. BRYDEN, Senior Orchardist, and E. G. HALL, B.Sc.Agr., Fruit Research Officer.*

THE experiments described in this article were conducted over a period of years to discover a technique of washing fruit which would reduce the residue below the prescribed tolerance.

In the last issue the authors summarised the results of previous investigations and gave details of 1939 washing and storage trials.

Results of the 1940 series are given in this issue.

1940 Experiments.

The 1940 experiments were designed to test further the efficiency of HCl solutions of 1 and 1½ per cent. concentration, and of 8 per cent. sodium silicate, using Granny Smith apples. A treatment where sodium silicate was combined with an additional bath in HCl 1 per cent. was also tried on fruit which had received different orchard spray treatments.

The series of washing treatments used on Granny Smith apples was as follows:—

1. Soaking in sodium silicate 8 per cent., rinsing spray, spraying with HCl 1 per cent. at 80-90 deg. Fahr., rinsing spray.
2. Soaking in sodium silicate 8 per cent., second soaking in HCl 1 per cent. at 80-90 deg. Fahr., spraying with HCl 1 per cent., rinsing spray.
3. Soaking in HCl 1 per cent. plus 1 per cent. oil (45-55 vis.) 80-90 deg. Fahr., spraying with acid and oil, rinsing spray.
4. As for test 3.
5. Soaking HCl 1 per cent. 80-90 deg. Fahr., spraying with acid, rinsing spray.
6. Soaking HCl 1 per cent. 80-90 deg. Fahr., double spraying with acid, rinsing spray.
7. Soaking HCl 1½ per cent. 80-90 deg. Fahr., double spraying with acid, rinsing spray.
8. Soaking HCl 1 per cent. 100-110 deg. Fahr., double spraying with acid, rinsing spray.
9. Soaking HCl 1 per cent. 80-90 deg. Fahr., double spraying with acid, rinsing spray.

In each case soaking treatment was for three minutes.

The spray programmes in 1940 were as follows:

A. Lead.—One calyx spray of lead arsenate; first cover lead arsenate and zinc sulphate; second cover lead arsenate and lime sulphur; third, fourth, fifth and sixth covers lead arsenate.

B. Lead-Oil.—Two calyx sprays lead arsenate; first cover lead arsenate and zinc sulphate; second cover lead arsenate and lime sulphur; third, fourth, fifth and sixth covers lead arsenate and white oil.

The concentrations were as follows:—

Lead arsenate, 28 oz. to 50 gals; zinc sulphate, 8-4-50; lime sulphur, 1-100; white oil, 1 per cent.; calcium caseinate spreader 1 lb. to 100 gals. to all sprays.

Determination of Residues, 1940.

The analytical data for 1940 are given in Table III.

HCl 1½ per cent. at 80-90 deg. Fahr. (treatment 7) and HCl 1 per cent. at higher temperatures (treatment 8) appeared again to be most effective. However, all treatments in the case of fruit sprayed with lead, and treatment 2 in the case of those sprayed with lead-oil were apparently satisfactory, the final residues being below the tolerance limit.

The amount of residue left on the fruit following treatment 3 was significantly greater than in other treatments. This treatment was less efficient for fruit sprayed with lead-oil (B) although similar treatment (treatment 4) was not appreciably different from others for fruit sprayed with lead (A).

Soaking in HCl (treatment 9) or in sodium silicate and HCl (treatment 2) gave significantly lower residues than the use of sodium silicate alone (treatment 1).

TABLE III.—Analyses, arsenic and lead residues, 1940, Granny Smith.

Test.	Spray Programme.	Washing Agent and Temperature.	Residues—Mean.	
			Arsenic (As_2O_3).	Lead (Pb).
			grs./lb.	grs./lb.
1	B Lead-oil.	Sodium silicate, 8 per cent.; 1 per cent. HCl, 80–90° F.	·0216	·0418
2	B	Sodium silicate, 8 per cent.; 1 per cent. HCl, 80–90° F.	·0098	·0188
3	B	1 per cent. HCl, plus light oil 1 per cent., 80–90° F.	·0233	·0432
4	A Lead.	1 per cent. HCl, 80–90° F.	·0085	·0148
5	A	1 per cent. HCl, 80–90° F.	·0097	·0173
6	A	1 per cent. HCl, 80–90° F.	·0094	·0168
7	A	1½ per cent. HCl, 80–90° F.	·0075	·0131
8	A	1 per cent. HCl, 100–110° F.	·0077	·0128
9	B	1 per cent. HCl, 80–90° F.	·0139	·0266
Check ...	A	No treatment ...	·059	·118
Check ...	B	No treatment ...	·071	·143

The differences necessary for significance are: Arsen 0·0074 grs./lb., lead, 0·0113 grs./lb.

*The analytical work in connection with these experiments was carried out by the late Mr. L. J. Wilson, B.Sc.Agr., Analyst.

Cool Storage, Granny Smiths, 1940.

The Granny Smiths were cool stored at 34 deg. Fahr. for eight months and were examined both on removal and after post-storage. The details of wastage for each treatment are given in Table IV.

The figures for acid wash injury were obtained at the examination ex cool store.

Lateral injury occurred in some fruits, mainly in treatments 2, 7 and 8 and there was most in treatment 8 where the temperature of the solution was raised to 100-110 deg. Fahr.

All treatments injured the fruit, but least injury resulted from treatments 6 and 9.

With the exception of treatment 3, all treatments seemed to increase the incidence of scald, probably because scalds and laterally occurring wash injury could not always be separated. The incidence of mould was not increased by the wash treatments and in most cases there was less mould than on the untreated fruits.

TABLE IV.—Percentage Wastage after Cool Storage, Granny Smiths, 1940.

Treatment.	Total Wash Injury.	Commercial Wash Injury.	Total Scalds.	Commercial Scalds.	Mould.	Commercial Wastage.
Check—No Treatment.	0·0	0·0	49·0	38·0	9·1	45·2
1	62·8	23·5	61·2	50·4	2·0	52·4
2	80·0	42·8	83·2	68·0	1·0	68·0
3	47·9*	19·3*	38·0	24·7	4·7	38·0
4	70·4†	22·5†	76·0	46·7	8·0	52·0
5	65·0	28·6	78·2	57·3	3·1	63·4
6	28·8	12·0	72·0	48·8	12·0	55·2
7	79·2	32·8	80·0	63·2	1·6	72·8
8	89·6	36·8	78·4	69·6	4·0	73·6
9	22·8	4·0	85·6	66·4	3·2	66·4

* Includes 13·3 per cent. calyx rots. † Includes 20·8 per cent. calyx rots.

Common Storage, Granny Smith, 1940.

The fruit was harvested and treated on 22nd April, 1940, and examined on 25th May, 1940, and again on 24th June, 1940. Details of the results are given in Table V.

Treatments 3 and 4, where the fruit was both soaked and sprayed with 1 per cent. HCl plus oil, caused spotting on about 10 per cent. of the apples soon after treatment. The spots showed as dull, discoloured areas and appeared similar to spray oil burn on apples on the trees.

Following five weeks in common store all treated Granny Smith apples could be regarded as in good condition. However, compared with Jonathan and Delicious, acid injury was more in evidence on the cheek and in the stalk cavity of fruits.

Severe injury in Granny Smith was dark in colour and unsightly in contrast to the greyish-brown markings indicating the injury on Jonathan and Delicious. It was, therefore, more noticeable, so much so that with the exception of treatments 3, 6 and 9, treated fruit would be considerably reduced in market value.

Examination at the end of ten weeks in common storage showed that all fruit was in similar condition to that recorded in the previous examination.

TABLE V.—Condition of Apples held in Common Storage after Treatment, 1940.

Test.	Calyx	Condition After *Five Weeks' Common Storage.
	Per cent.	
1	78	Good generally; some injury stalk and cheeks.
2	78	Good generally; injury more pronounced on cheeks.
3	8	Very good condition; injury very slight.
4	64	Good generally; injury very slight.
5	75	Good generally; some injury stalks and cheeks.
6	25	Good generally; some injury on cheeks—injury very slight.
7	94	Severe injury extending to cheeks and stalk cavity.
8	94	Very severe injury and more extensive on cheeks and stalk cavity.
9	16	Very good condition; injury very slight.
Check No Treatment.	...	Very good condition.
Check No Treatment.	...	Very good condition.

* After approximately 10 weeks on common storage Granny Smith apples were in similar condition. Acid injury had not extended or developed breakdown.

Storage of Jonathans and Delicious.

As raising the temperature of the soaking solution had given promising results in 1939, additional tests were carried out in 1940 with Jonathan and Delicious apples to determine the effects of a range of higher treatment temperatures on the keeping qualities of the fruit, in both cool storage and under common storage conditions. These apples were not submitted for analyses of spray residues.

The washing treatments included soaking for two minutes, acid spraying with HCl 1 per cent. and 1½ per cent. at various temperatures ranging from 70-80 deg. Fahr. to 120-130 deg. Fahr. In each treatment the fruit received a final rinsing spray with water.

Cool Storage, Delicious, 1940.

The results with Delicious apples held in cool storage for nine months are given in Table VI.

In the case of Delicious all acid wash treatments injured the fruit. Treatments at temperatures above 100 deg. Fahr. caused considerable injury and at 120-130 deg. Fahr., with both strengths of acid there was more than 80 per cent. of acid wash injury of commercial significance.

Only small amounts of calyx injury occurred at temperatures up to 90 deg. Fahr., but at the higher temperatures wash injury extended around the stem and elsewhere on the fruit.

There was some calyx rotting in washed Delicious apples, particularly at the higher temperatures, and this was no doubt due to the fact that many Delicious have open calyxes and are thus more susceptible to calyx injury due to penetration of acid or soluble arsenic.

TABLE VI.—Percentage Wastage after Cool Storage, Delicious, 1950.

Treatment.	Total Wash Injury.	Commercial Wash Injury.	Mould.	Breakdown.	Superficial Scald.
Check—No treatment	0·0	0·0	3·6	6·4	3·7
12A—HCl 1 per cent., 70–80° F.	13·5	2·8	8·2	8·2	4·5
12C—HCl 1 per cent., 80–90° F.	8·8	4·2	5·7	13·7	3·7
12E—HCl 1 per cent., 100–110° F.	68·4	35·5	9·3	17·5	9·3
12G—HCl 1 per cent., 110–120° F.	92·0	66·4	20·8	10·8	11·8
12I—HCl 1 per cent., 120–130° F.	90–100	80·0	25·7	11·5	4·3
12B—HCl 1½ per cent., 70–80° F.	13·7	1·7	2·2	5·8	4·3
12D—HCl 1½ per cent., 80–90° F.	17·1	6·6	2·5	18·3	5·0
12F—HCl 1½ per cent., 100–110° F.	64·2	44·1	6·9	11·8	16·3
12H—HCl 1½ per cent., 110–120° F.	79·3	51·5	16·3	18·0	14·4
12J—HCl 1½ per cent., 120–130° F.	90–100	80·0	20·8	17·3	11·5

TABLE VII.—Condition of Delicious Apples Held in Common Storage after Treatment, 1940.

Treatment.	Calyx Injury.	Condition After Storage Period.	
		4 Weeks.	6 Weeks.
	per cent.		
12A—1 per cent. HCl, 70–80° F. ...	10	Good generally	Good—fruit firm.
12C—1 per cent. HCl, 80–90° F. ...	...	Good generally	Good—fruit firm.
12E—1 per cent. HCl, 100–110° F. ...	53	Good — some injury stalk cavity.	Fair—lacking crispness.
12G—1 per cent. HCl, 110–120° F. ...	78	More severe injury—stalk and cheeks.	Fruit softening in injured area.
12I—1 per cent. HCl, 120–130° F. ...	81	More severe injury—stalk and cheeks.	Fruit softening in injured area.
12B—1½ per cent. HCl, 70–80° F. ...	...	Good generally	Good—fruit firm.
12D—1½ per cent. HCl, 80–90° F. ...	...	Good generally	Good—fruit fairly firm.
12F—1½ per cent. HCl, 100–110° F. ...	40	Some injury stalk cavity ...	Fruit commenc ng to soften.
12H—1½ per cent. HCl, 110–120° F. ...	75	More severe in jury—some on cheeks.	Breakdown at severe injury.
12J—1½ per cent. HCl, 120–130° F. ...	81	Very severe injury—calyx, and cheek; 2 apples breakdown.	Breakdown at severe injury—some decay.
Check—No treatment	...	Very good	Good—fruit firm.

TABLE VIII.—Percentage Wastage after Cool Storage in Jonathans, 1940.

Treatment.	Calyx Injury.	Acid Spot.	Total Wash Injury.	Commercial Wash Injury.	Mould.	Breakdown.	Bitter Pit.	Johnathan Spot.
Check—No treatment	...	...	...	...	7·0	22·1	10·7	16·8
12A—HCl 1 per cent., 70–80° F. ...	36·3	...	24·8	11·5	14·1	24·0	15·9	7·0
12C—HCl 1 per cent., 80–90° F. ...	22·1	3·5	23·0	2·6	17·7	24·8	7·9	6·1
12E—HCl 1 per cent., 100–110° F..	26·5	7·9	31·0	0·8	8·8	29·2	14·1	12·3
12G—HCl 1 per cent., 110–120° F. ...	32·7	6·1	32·7	7·9	10·7	17·7	13·3	2·6
12I—HCl 1 per cent., 120–130° F. ...	49·5	11·5	54·8	12·3	7·0	13·3	16·8	5·2
12B—HCl 1½ per cent., 70–80° F. ...	37·1	2·6	37·1	11·5	2·6	14·9	7·0	2·6
12D—HCl 1½ per cent., 80–90° F. ...	25·6	2·6	24·8	6·1	4·4	14·9	11·5	1·4
12F—HCl 1½ per cent., 100–110° F. ...	33·6	4·4	35·4	1·4	6·1	5·2	7·0	2·6
12H—HCl 1½ per cent., 110–120° F	40·7	14·1	46·9	9·4	7·0	12·3	7·9	0·8
12J—HCl 1½ per cent., 120–130° F	58·4	18·5	62·8	14·1	7·0	22·1	5·2	6·1

The higher temperature treatments, which caused considerable injury, inoreased mould wastage and superficial scald and tended to increase breakdown.

Common Storage, Delicious, 1940.

Delicious apples were harvested and treated on 8th April, 1940, and examined on 8th May, 1940, and again on 20th May, 1940. The details of condition after common storage are shown in Table VII.

Small amounts of very slight acid injury, mainly in the calyx depression and to a lesser extent in the stalk cavity, were noticeable in Delicious from the higher temperature series in both the 1 per cent. and 1½ per cent. HCl groups soon after treatment.

After one month in common store the number of fruits showing acid injury was found to be progressively greater, the higher the temperature of the soaking solution, reaching 81 per cent. in the case of both 1 and 1½ per cent. HCl at 120-130 deg. Fahr.

Fig. 14.—Blackening around the Calyx of Jonathan Apples as a result of Wash Injury.

The degree of injury was comparatively more severe in Delicious than in Jonathan subjected to the same treatment. In the case of Delicious there were a number of instances where acid injury extended to both the stalk cavity and the cheek of the fruit.

After six weeks in common store Delicious apples in the 70-80 deg. Fahr. temperature series remained firm and in good condition, but a degree of deterioration was noticeable in others, being more pronounced in the higher temperature treatments. The deterioration occurred as slight softening and advanced to breakdown, and in each case commenced in portions of the flesh adjacent to acid injury.

Cool Storage, Jonathan, 1940.

Jonathan apples were cool stored for six months and examined ex cool store and after post-storage. The results are presented in Table VIII.

As in 1939 all treatments caused some injury to the fruit. Most of the injury was browning or blackening around the calyx with practically no calyx rotting, but there was also some light coloured depressed spotting centred on the lenticels. With both strengths of acid there was least injury at 80-90 deg. Fahr. and most at the highest temperature. Acid injury at the lenticels occurred mainly in fruit soaked in acid at temperatures over 100 deg. Fahr. From the point of view of resultant injury, the temperature of the bath was more important than the strength of the acid.

The acid wash treatments did not increase ordinary storage wastage and the treatments generally decreased the incidence of Jonathan Spot.

There was less commercial wastage in the fruit washed in 1½ per cent. acid than in the 1 per cent. acid group or the control fruit. Considering the effects on ordinary storage wastage as well as injury, the best treatment was 1½ per. cent. acid at 80-90 deg. Fahr. (treatment 12D).

Common Storage, Jonathans, 1940.

In Table IX the effects of the various treatments on common stored Jonathan apples are shown. The fruit was harvested on 13th March, 1940, treated 14th March, 1940, and examined on 2nd May, 1940.

There is no obvious explanation of the variation in acid injury which was evident in treated Jonathans after seven weeks in common storage.

TABLE IX.—Condition of Jonathan held in Common Storage for Seven Weeks after treatment, 1940.

Test.	Washing Treatment.	Calyx Injury.	Break-down.	Jona-than Spot.
		P. cent.	P. cent.	P. cent
12A	1 per cent. HCl—70-80° F.	37	20	22
12C	1 per cent. HCl—80-90° F.	...	27	44
12E	1 per cent. HCl—100-110° F.	...	20	44
12G	1 per cent. HCl—110-120° F.	...	14	18
12I	1 per cent. HCl—120-130° F.	30	16	38
*12B	1½ per cent. HCl—70-80° F.	43	9	33
12D	1½ per cent. HCl—80-90° F.	...	9	25
12F	1½ per cent. HCl—100-110° F.	...	16	11
12H	1½ per cent. HCl—110-120° F.	22	18	7
12J	1½ per cent. HCl—120-130° F.	54	4	2
Check ...	No treatment	...	15	26

* In treatment 12B, acid injury was more pronounced than in fruit from any other treatment.

It was to be expected that injury would be progressively greater in the higher temperature groups and particularly where stronger acid concentrations were employed. However, in the series using 1 per cent. HCl the lowest and the highest temperatures showed injury while in the tests with 1½ per cent. HCl acid injury was more pronounced on fruit treated at the lowest temperature (70-80 deg. Fahr.) although a greater percentage of apples were affected at the highest temperature

(120-130 deg. Fahr.). It is interesting to note that similar effects were in evidence in cool stored fruit and the type of injury suggests some fault in the rinsing process.

There was no evidence to suggest that the incidence of breakdown or Jonathan Spot after seven weeks in common store was influenced in any way by the treatments.

(To be concluded.)

Application to Purchase Tractors.

IN future intending purchasers of new wheel type tractors or new or second-hand crawler or cletrac type tractors should submit their applications direct to the State Controller of Agricultural Machinery, Department of Agriculture, Box 36A, G.P.O., Sydney.

In the past, War Agricultural Committees acted as sponsoring authorities to these applications. Following a recent decision of the Commonwealth Government, however, War Agricultural Committees in New South Wales were disbanded as from the 14th March.

The necessary application forms for the purchase of the machinery mentioned above are available from all local machinery firms or from the State Controller. Should the Controller require information additional to that supplied on the forms, reference will be made to departmental officers in the districts concerned.

After-care of Reworked Fruit Trees.

BESIDES the growth from the inserted buds or scions on reworked fruit trees, many growths will start from the stock below these points. On nursery stock these growths are generally better rubbed off on sight, but on established trees that have been worked over with another variety it is far better to allow some of the growths from below the inserted buds or grafts to remain.

However, attention is required or these growths may sap the growths from the inserted buds or grafts. Some of the shoots from below the buds or grafts will show great vigour, and are better rubbed off at once or they will be a constant menace. The weaker shoots are better allowed to remain, but should be inspected occasionally, and if any grow strongly they should be pinched or slashed back to prevent them sapping the growth from the inserted buds or grafts.

The advantage of leaving some growth on the stumps of worked-over trees below the buds or grafts is threefold. In the first place, these growths provide some foliage to assist in the elaboration of the raw sap. It must be remembered that by cutting back the main limbs for grafting or budding the major part of the foliage is lost, and the roots thereby suffer partial starvation till sufficient growth is made to restore the balance between root and top. Secondly, the growth on the stumps shades the bark from the sun and promotes sap circulation, which prevents the sun from scalding the bark and thus establishing entry points for wood-rot fungi. Thirdly, the extra growth assists in protecting the tender new shoots from the inserted buds or grafts from breakages by wind.

Sometimes when working over established trees some limbs are left unworked; where this has been done it is often necessary to check their growth during the following growing season, or they will sap the growth from the buds or grafts too much.

Junior Farmers' School to be Held at Hawkesbury Agricultural College.

A SCHOOL for Junior Farmers is to be held at Hawkesbury Agricultural College, Richmond, from 2nd to 12th July next. Short courses will be given in dairying, pig farming, poultry farming and vegetable growing.

In announcing this decision the Minister for Agriculture, Mr. Graham, stated that he appreciated the great national importance of the Junior Farmers' Club movement, and he felt sure a great deal of benefit would follow from the instruction given to the junior farmers who would attend. Provision is being made for sixty junior farmers to be present at the school—fifteen in each of the four branches of farming covered. As an additional measure of assistance, the Minister has decided in this particular instance that no charge is to be made for tuition or for board and lodging, so that the school will be within reach of all club members, irrespective of their financial position.

Details of the courses of instruction will be worked out by the Organiser of Junior Farmers' Clubs in collaboration with the Principal of Hawkesbury Agricultural College.

INSECT PESTS.
Notes contributed by the Entomological branch

INSECT PESTS OF STORED GRAIN.

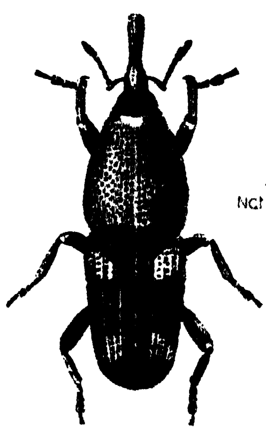
WHEREVER grains such as wheat, oats, maize, etc., are stored on the farm, in stacks, silos or other containers, particularly during the summer months, the problem arises of preventing or controlling insect infestations.

Insects that Attack Stored Grain.

Although a wide variety of cosmopolitan insects may be found in association with stored grain, during different periods of storage, they may be divided into two main groups, as follows:—

(1) Primary pests—those which are capable of attacking sound grain; and

(2) Secondary pests—those which attack the grain after it has been damaged either by the primary pests, or through some other agency, and continue or complete its destruction.



The Common Grain Weevil.

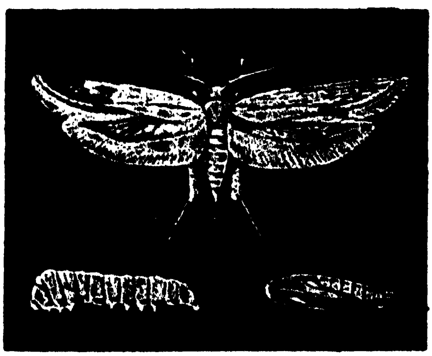
Not size

There are four primary pests of stored grain, and these are the common grain weevil (*Calandra oryzae*), the granary weevil (*Calandra granaria*), the Angoumois or common grain moth (*Sitotroga cerealella*), and the lesser grain borer (*Rhizopertha dominica*).

The Common Grain Weevil.

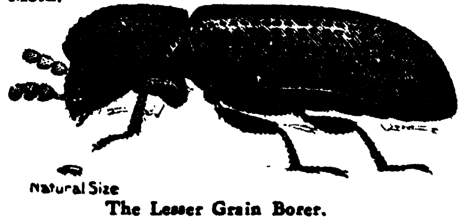
Infestation of grain by this weevil usually occurs after the grain has been harvested, but on the north coast of this State, early maize crops may become infested in the field, and maize held there in barns during the spring and summer is frequently damaged. In the field, maize cobs with loose or poorly developed husks or with the grain exposed at the tips, and cobs that have been attacked by the caterpillars of the maize (or tomato) moth (*Heliothis armigera*), are most liable to attack.

The eggs are laid in small cavities which the female chews in the grain by means of its slender proboscis or beak. During the warm weather, eight to ten eggs may be laid each day and about four hundred may be laid by an individual female



The Angoumois Grain Moth.

The small, white egg, which measures about 1/50th inch in length, hatches in about three or four days during the warmer weather, but may require about nine days during cold weather. On hatching, the minute legless larva or grub usually bores directly down into the centre of the grain, but may tunnel near the



Natural Size

The Lesser Grain Borer.

surface, the tunnels becoming filled with white frass and debris.

When fully-fed, the larva, which then measures slightly less than ⅛ inch in length, is a pearly-white, thick-bodied grub. It enters its pupal or chrysalis stage in a cell at the end of its burrow. On first changing into the adult, the weevil is soft and light-brown in colour, but it remains within its cell in the grain until it has hardened and become darker. It usually eats its way out of the grain within a few days of becoming adult, the small circular emergence hole of the beetle showing in the seed coat.

The adult beetle, which measures about 3/16th inch in length, is dull brown in colour, and its wingcovers are marked with four reddish spots. It is a typical weevil, and has its head produced forward to form a proboscis or beak, at the tip of which its jaws are situated. This weevil can fly readily.

The period occupied in development from egg to adult, during summer, averages about four weeks, and adults that emerge during the spring and summer may live from three to six months. Under conditions in this State it is probable that six or even seven generations may develop during the year.

Stored grain containing less than 8 per cent. of moisture is not suitable for the development of weevils.

The Granary Weevil.

This weevil has a very similar life-history to that of the common grain weevil, and is similar in general appearance, but it lacks the reddish spots on its wingcovers, and has no wings. It is only occasionally met with in stored grain in New South Wales.

The Angoumois Grain Moth.

The caterpillars of this moth feed upon various grains, and although the ears may be attacked in the field, most damage occurs during storage, when generation after generation of moths may develop. It is a serious pest of maize and wheat. In the early stages of infestation, the injury is difficult to detect, as the hole made by the larva in boring into the seed is extremely small.

The adult, which measures about ½ inch across its outspread wings, is a yellowish-brown or buff-coloured moth. It closely resembles the common clothes moth, and when such moths are seen flying about grain it may be suspected of being infested with this common grain moth.

The eggs are laid either singly or in batches upon or near their food, and as many as 150 to 300 eggs may be laid by an individual female. The young caterpillar bores a hole into a grain and feeds within, until, when fully-fed, it eats out a tunnel towards the outside of the seed, leaving only a thin layer of the seed-coat intact. It then enters its pupal or chrysalis stage within the tunnel, and later emerges as an adult moth, which pushes off the thin section of the seed-coat that covers the exit to the tunnel.

The life-cycle, from egg to adult, may be as short as five weeks during warm weather, and numbers of generations occur during the year.

The Lesser Grain Borer.

This insect belongs to a family of beetles, most of the members of which are wood borers. The damage, which is caused by both the larvae and adults, may be distinguished from that of the grain weevils by the fact that the whole of the starchy interior of the grain is destroyed, and large irregular pieces are eaten out of the seed coat. A considerable amount of floury frass also accumulates amongst the grain.

The adult, which measures about ⅛ inch in length, is a dark brown, cylindrical beetle, and can fly readily. Its head, which is turned down, is almost completely concealed from above by the prothorax.

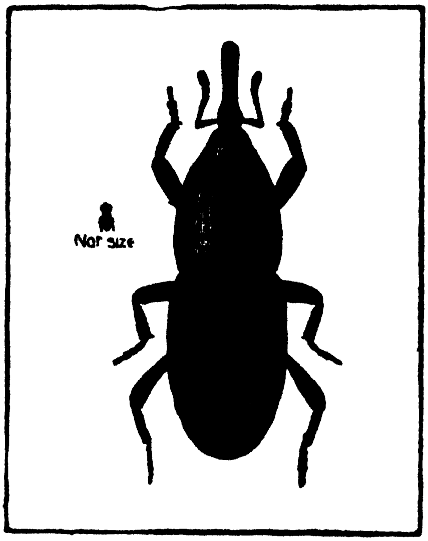
This borer lays its eggs loosely amongst the grain, and more than 300 eggs may be laid by an individual female. The larvae or grubs which hatch after about five days, are able to move about freely and rapidly amongst their food, but they soon enter the grain through any damage on the surface and feed within. The pupal or chrysalis stage is passed within the grain.

The life-cycle from egg to adult during warm weather occupies from about twenty to forty days.

Itch Mites.

Where insect infestations occur in stored grain, or in sheaves containing grain, mites, popularly known as "hay itch mites" (*Pediculoides ventricosus*) are likely to become abundant. These mites readily attack man, and their bites may cause an

irritating rash or itching swellings. They do not, however, feed for long on the human body, and must feed on one of their normal hosts to complete their development. Stock fed on grain, etc., infested with these mites may also be severely attacked about their mouths and eyes. This mite, which only measures about 1/125 inch in length, is an



The Granary Weevil.

external parasite of insect larvae, and its normal hosts are the soft-bodied caterpillars of the Angoumois grain moth, the larvae of grain weevils and other insects which are commonly found in stored grain and cereal products.

Other species of mites may infest grain which has a high moisture content or in which moulds have developed.

Control Methods.

Prevention of Infestation.

The first essential in preventing the new season's grain from being attacked is a thorough and systematic clean up of all possible sources of infestation. Barns in which wheat may have been stored, even temporarily, should have the walls and floors swept and sprayed with kerosene or strong kerosene emulsion to kill all insects not removed during the cleaning process. All waste grain and sweepings should be removed and destroyed.

All machinery should be examined and cleaned, and all second-hand bags should be thoroughly brushed inside and outside or dipped in boiling water and dried.

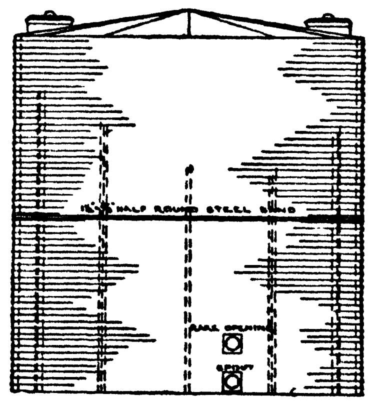
Storage in Bulk.

Grain on the farm is best stored in iron or concrete silos, iron tanks, or tightly-fitted bins. When these are thoroughly sealed up, there is very little variation in moisture content, and the amount of carbon dioxide produced by the grain is generally sufficient to prevent insect development. When storing wheat, oats or maize in tanks or silos, it is important to ensure that the grain is fully matured when harvested, and that it does not contain excessive moisture; otherwise it heats, particularly if weevils are present, and moulds may develop.

Storing Bagged Grain.

Where silos, or tanks, etc., are not available and it is necessary to store grain in bags, there is a greater danger of infestation by insects. If the bags are to be stored in a barn, it should be thoroughly cleaned beforehand. A barn with a boarded or concrete floor is preferable, and all cracks or openings should be plugged or closed to prevent the entrance of rain. This will also make it possible to fumigate successfully, should it become necessary.

When the grain is stacked in bags, these should be placed on a concrete or closely boarded floor, and arranged so that a margin one foot wide is left around the edges of the



A Galvanised Iron Grain Silo.

floor. The roof should be constructed so as to remain waterproof, and the sides well protected to keep the bags dry.

Encasing the stack entirely with malthoid or similar material, and sealing all joins is an effective method, and will also permit the stack to be fumigated effectively if required.

Fumigation with Carbon Bisulphide.

Should grain stored in silos, tanks, or other airtight containers, become infested with insects, it may readily be fumigated, and for this purpose carbon bisulphide may be used.

This liquid, which gives off a gas heavier than air, may be poured into a shallow tray on top of the grain, or on to a bag placed on top of the grain itself, after which the opening or door should be carefully sealed. Where gas-tight containers, or receptacles which can be made reasonably airtight by sealing, are available, the carbon bisulphide is used at the rate of 5 lb. (approximately 3 pints) to each 1,000 cubic feet the container will hold, no notice being taken of the actual amount of grain stored. A silo or shed that holds 1,000 bushels of grain when full, has an air space of approximately 1,300 cubic feet.

The gas is allowed to act for 24 hours or longer, but when the grain is required for seed purposes, the 24 hours should not be exceeded. After fumigation the tank or silo, etc., should be opened up to allow the fumes to escape.

WARNING: *Carbon bisulphide is explosive.* Carbon bisulphide has the disadvantage that its gas, when mixed with air, is highly inflammable and explosive, and to overcome these hazards, non-inflammable carbon bisulphide mixtures, and mixtures of ethylene oxide and carbon dioxide or ethylene dichloride and carbon tetrachloride (three parts to one part by volume) are sometimes used.

No light of any description (pipes, cigarettes, fires or embers, radiators, stoves, etc.) must be allowed in or near sheds or buildings during the process of fumigation with carbon bisulphide. The precaution should also be taken of cutting off the electric current. Hot steam pipes have been known to cause explosion of this gas, and the steam should be cut off and the pipes allowed to cool before proceeding with fumigation.

It should be realised also, that any fumigant that is toxic to insects is also toxic to man, and that it is necessary to take every precaution to avoid exposure to heavy concentrations of fumigants. Some fumigants even may lack a distinctive odour at concentrations toxic to man.

Protection of Seed Wheat.

Seed wheat may be protected from insect attack by treating with either magnesite or copper carbonate powder before bagging or storing. The dusts must be mixed with the grain in such a manner as to ensure that every grain is covered with a fine coating of the chemical.

Magnesite is mixed with the grain at the rate of 1 per cent. (approximately 10 oz. per bushel).

Where seed wheat has to be treated for "bunt," copper carbonate is used at the rate of 2 oz. per bushel, and this also controls grain insects.

Mercury dusts and copper oxychloride are also used to control fungous diseases of seed wheat (*see* Plant Diseases Leaflet No. 28), and it is possible that these dusts may also prevent insect attack.

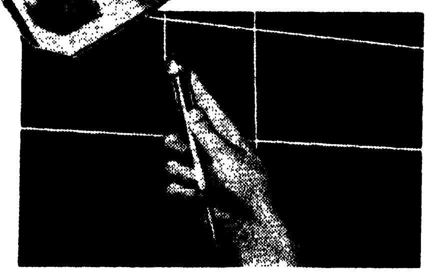
Mr. A. W. S. Moodie is the New Chief of Division of Plant Industry.

MR. A. W. S. Moodie has succeeded Mr. A. H. E. McDonald, recently retired, as Chief of the Division of Plant Industry of the Department of Agriculture.

Announcing the Public Service Board's approval of the appointment, the Minister for Agriculture, Mr. Graham, said that Mr. Moodie entered on his new duties at a time when many problems and opportunities were arising in the field of agricultural production.

Since February, 1944, Mr. Moodie had occupied the position of Chief Instructor of Agriculture, in which capacity he directed the activities of about thirty field instructors. In addition to his departmental duties, he was at present acting for the Commonwealth Government as Deputy Co-ordinator of Rural Training, being responsible for the training of ex-servicemen in New South Wales. During the war period he acted for the Commonwealth as Fertiliser Rationing Officer in this State.

In his earlier position of Senior Agrostologist he had made a valuable contribution to the excellent work carried out on pasture improvement in this State, and was primarily responsible for framing the provisions of the Agricultural Holdings Act, 1941, an Act designed to rectify the unsatisfactory position of rural tenancy, especially as regards tenants' rights to compensation for improvements.



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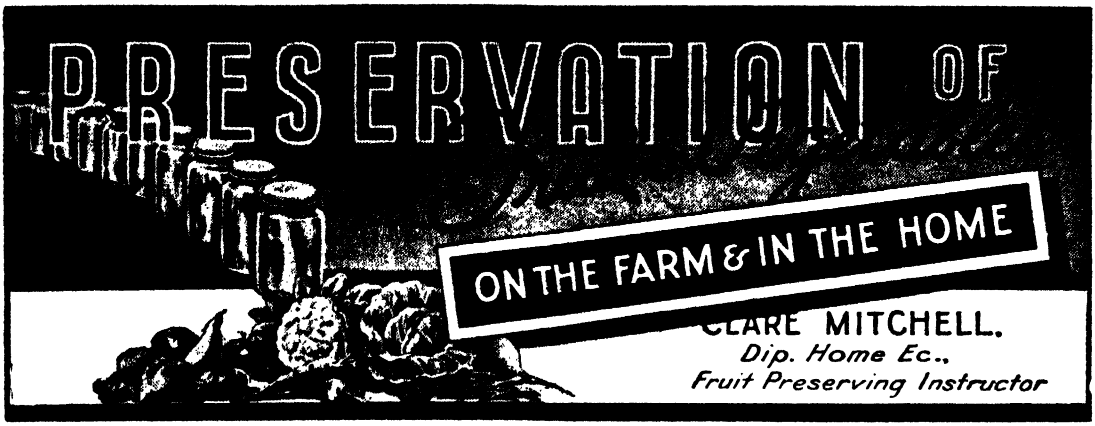


PINEAPPLE RECIPES.

PINEAPPLES are universally popular and lend themselves to many methods of serving. The flesh may be shredded, diced or sliced into rings —and eaten raw or stewed, or preserved for future use.

Pineapple added to apple jelly, or to melon jam, gives a zest to the flavour. The skin and the core need not be wasted, but can be boiled with water to extract the flavour, and then made into dessert jelly or used as the basis of many fruit drinks or pre-dinner appetizers.

Preserved Pineapples.

Preserved pineapples are a boon to a busy housekeeper—and they are easy to bottle. Whether they are diced, shredded or cut into rings, the best results are obtained by precooking the pine for a few minutes before bottling it. The method of preserving is as follows:—

1. Peel the pineapple carefully, and wash it to remove any pieces of peel or sticks.
2. Cut into pieces of any shape desired.
3. Place the cut pine into a large pan and add any juice which was saved when cutting, and a little water (do not cover the fruit with liquid).
4. Place a lid on the pan and heat until simmering, and cook for a few minutes until the pieces change colour—from 8 to 15 minutes.
5. Remove the pineapple and pack it into hot jars while the fruit is still warm.
6. Add sugar to taste to the liquid left in the saucepan. There may not be sufficient syrup, but more water may be added to the fruit at this stage, if necessary.
7. Boil the syrup for 5 minutes and then fill the jars with it, whilst it is still boiling.
8. Remove air bubbles by running a knife down the sides and bumping the jar gently on the table.
9. Place the rubber and lid on and seal; then place the jars in boiling water to cover them and process for 15 minutes, with the water boiling.

Shredded Pineapple.—If bottling shredded pineapple, shred the pine, save the juice and add sugar to taste, and boil all gently together for 5 to 10 minutes.

Fill the hot bottles with boiling pulp and process as above.

Pineapple Rings.—Pineapple rings are the most attractive pack and lend themselves more to decorative sweets and puddings. This pack is shown in the accompanying illustration.

Pineapple and Banana Delight.

Pineapple and banana delight makes a simple, but very showy dessert; so, too, do "candlesticks."

Materials (to serve six persons):—

6 Rings pineapple.
3 Bananas.
Sugar.

Red jelly (make jelly and allow it to set).

Custard (1 pint milk, 2 dessertspoons sugar, 3 level dessertspoons gelatine).

Method:—

(1) Heat the milk and sugar until the sugar dissolves.

(2) Beat the eggs well.

(3) Pour warm milk on to the eggs and return to the saucepan.

(4) Stir until it thickens, but do not allow it to boil.

(5) Cool the custard by standing in cold water.

(6) Dissolve the gelatine in a little hot water.

(7) When custard is almost cold, add the dissolved gelatine and stir in well.

(8) Pour into a wetted scone tray and set until firm.

(9) Cut the custard into twelve rings the size of the pineapple, using a scone cutter.

(10) Place a ring of custard on six individual plates and cover it thickly with sliced banana. Place another ring of custard on top like a sandwich.

(11) Top this with a ring of pineapple.

(12) Chop the red jelly up finely and fill the centre of each pineapple ring. Surround each dish with chopped red jelly.

Candlesticks.

These are effective sweets for any party, particularly a children's party.

They are made with a ring of preserved pineapple, with the core cut out of the centre. Peel half as many bananas as there are slices of pineapple. Sharpen each end of the bananas to look like a candle, cut them in halves and steep for a few minutes in lemon juice.

Place each slice of pineapple on a small glass plate and insert a half banana in the centre of each pineapple ring. Cut a small triangular piece of pineapple and place it against the banana to form a handle.

When cream is available, it may be used to decorate the edge of the ring. Slices of banana placed around the edge of the dish improve the appearance and add to the quantity.

Pineapple Rings Preserved in a Glass Jar.
Note the method of packing.

Fried Pineapple.

Last of the recipes, but not the least important, is fried pineapple, which is best when served with grilled lamb chops.

Dip rings of pineapple into flour, seasoned with salt and pepper. Heat enough fat barely to cover the bottom of the frying pan and fry until brown and crisp on the outside.

Garnish with parsley and serve with grills and bacon rolls.

KEEP ON BUYING VICTORY BONDS.

PLANT DISEASES

BACTERIAL CANKER of Stone Fruit.

F. L. MILLTHORPE, Plant Pathologist and
A. E. VINCENT, Fruit Inspector.

BACTERIAL canker attacks all stone fruit trees, causing gumming and a sour-smelling condition of the bark. It often kills limbs or whole trees and will attack buds, blossoms, leaves and fruits.

This disease occurs throughout New South Wales and has caused serious losses of apricot, cherry, nectarine, peach and plum trees. Infection of young trees is particularly severe, and usually results in the death of the tree.

Details of symptoms and tentative control measures are given below.

Symptoms.

Limb infection results in the formation of of cankers of which there are two types:—

(1) One form is characterised by the exudation of large amounts of gum. The bark dies and extensive brown discoloration of the outer tissues of the wood occurs. This condition is known as a "gummosis canker."

(2) The other form of canker, which involves a brown, moist condition of the bark, first appears as a slightly sunken area, and it may be necessary to cut away the outer tissues before dead cells can be observed. In advanced stages such areas give off a sour, fermented odour which is responsible for the term "sour sap canker."

The sour sap canker is often difficult to find until the spring, when growth of the tree commences, but the gummosis canker is readily seen by the copious exudation of gum. Collapse and death of a limb or tree may not result until mid-summer, when it will occur suddenly.

Leaf infection produces a water-soaked spotting; these spots soon turn brown and

Fig. 1.—Gummosis Canker on Apricot.

Fig. 2.—Young Plum Tree, showing Thin, Narrow Foliage as a Result of Sour-sap Canker. Seen on the Upper Trunk and Crotch.

Fig. 3.—Dieback of Leaders of Cherry, due to Stem Canker.

Fig. 4.—Dieback of Apricot Limb, which had Collapsed Suddenly in Summer

drop out. Other foliage symptoms, particularly of plum and peach, are seen as thin, narrow, often rolled leaves with a yellow colour. Blighting of buds and blossoms occurs, the former being very important. Wilting of the current terminal growth may result on young, sappy shoots growing in a moist atmosphere. Fruit infection of cherry and apricot is shown by depressed spots with dark centres and underlying gum pockets.

Fig. 5.—Leaf Infection of Cherry, showing Water-soaked Spots, which later turn Brown.

Cause and Disease Development.

The disease is caused by a parasitic bacterium (*Pseudomonas cerasi* var. *prunicola*) which infects the trunk or lower limbs during late autumn and winter. Infection takes place through cracks, wounds or dormant buds. The resultant canker spreads rapidly and grows until early spring. It stops extending when tree growth recommences in the spring. Leaf and fruit infection may occur throughout the growing season, but this phase is not common in this State.

Control Measures.

Experimental work is still proceeding with this disease; the control measures recommended here must, therefore, be regarded as tentative.

1. Pruning should be completed as soon as possible after leaf-fall. Pruning cuts are one of the main points of entry of the bacterium and a large proportion of infection occurs through them if pruning is

Fig. 6.—Canker and Bud-gumming resulting from Infection through Bud.

carried out in mid-winter. Any pruning of cherry trees required should be done before early autumn.

Fig. 7.—Bud Blight and Gumming of Apricot

2. Spray with Bordeaux mixture (15-15-100) in early May, mid-June, and late July. The addition of ½ gallon white oil per 100 gallons spray or a good spreader will increase the efficiency of the spray. These sprays will assist in protecting the trees from invasion by the bacteria.

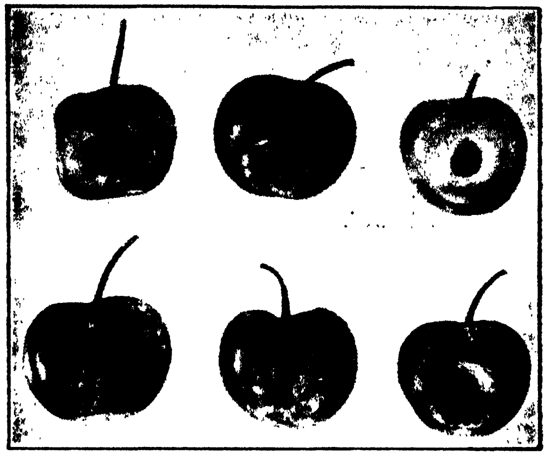


Fig. 8.—Cherries Infected by the Bacterial Canker Organism.

3. Well-marked varietal resistance has been shown among English and American varieties and attention is being given to the production of trees worked on a framework of a resistant variety. Recommendations on this aspect cannot be given until further investigations have been completed.

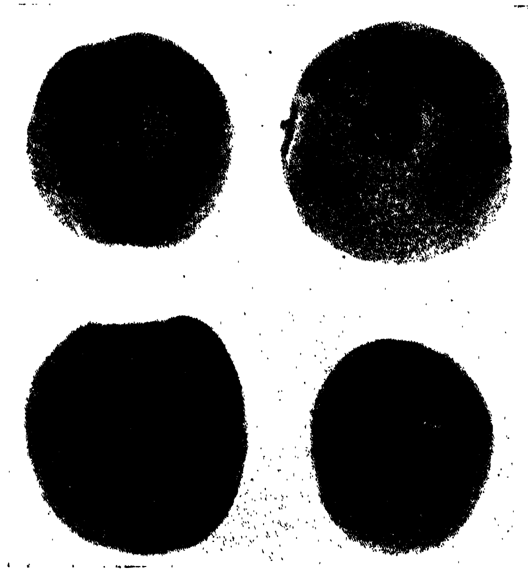


Fig. 9.—Fruit Infection of Apricot.

Seed Treatment for the Control of Bunt in Wheat.

WHEAT growers are urged to pay particular attention this season to the treatment of seed for the prevention of bunt or stinking smut, of which there has been a noticeable increase during the war years. The disease can be easily controlled if the recommended treatment is thoroughly carried out.

Two methods are available, viz., dry-dusting with copper carbonate, copper oxychloride or organic mercury preparations, and the wet pickle, but the dry treatment has many advantages over the wet pickle, and has now come into favour generally throughout the wheat-growing regions of the world. Satisfactory dusts suitable for seed treatment are available on the market under a number of trade names. It is recommended that the directions given by the manufacturers be closely followed.

To prevent the irritating effects caused by the exposure of the operator to the dusts, to ensure that every grain is sufficiently coated with dust, and for greater convenience in treating a quantity of wheat, something in the nature of a dusting contrivance is necessary. For farm use an ordinary cask, fitted with slats inside to agitate the wheat, and mounted so that it can be easily revolved is really all that is necessary. The method of dusting is simply to pour a convenient measured quantity of the seed into the cask, add the dust and rotate the cask for two or three minutes.

Contract graders have introduced methods of dusting at the same time as grading. Farmers should make certain (a) that reputable dusts are being used, and (b) that the grain is receiving a thorough coat of dust. The dusts should be used at the rate of 2 oz. per bushel or 6 oz. per bag.

Dairy Science Schools, 1946.

DAIRY science schools for those desiring to qualify for certificates for milk and cream testing and cream grading are to be held as usual in country centres during the coming winter months, but the schools will be held only at those places where there is a guaranteed minimum attendance of ten candidates for that particular school.

Before a cream grading or cream testing certificate will be issued, evidence of twelve months' experience in a dairy produce factory (butter) will be required. Before a certificate covering milk testing will be issued, evidence will be required to satisfy the Chief of the Division of Dairying that the candidate has had sufficient practical experience.

Applications for attendance, accompanied by a fee of 10s. 6d., should be addressed to the Under Secretary and Director, Department of Agriculture, Box 36A, G.P.O., Sydney. The closing date for the receipt of applications is 31st May.

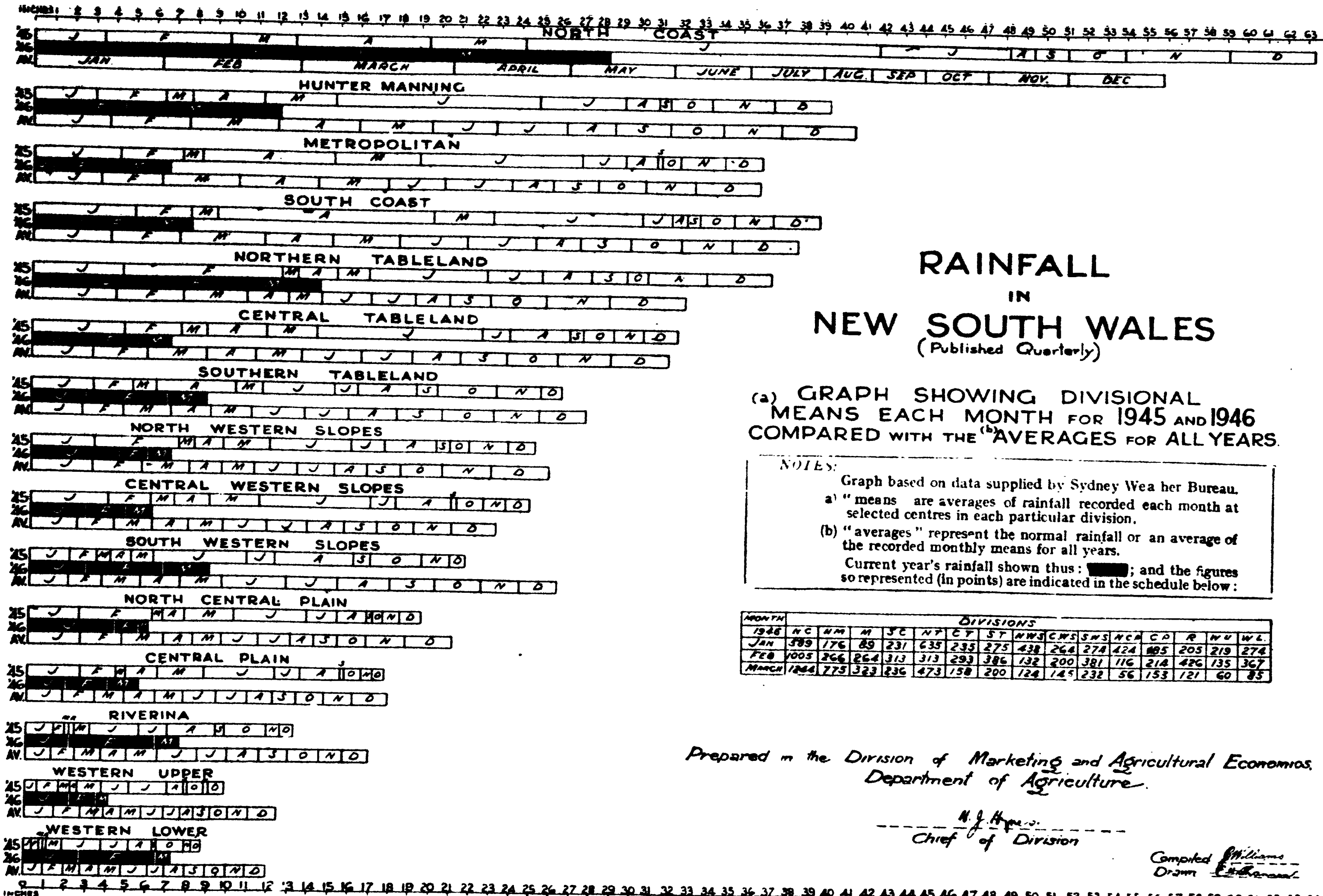
Sheep and Wool Research at Trangie Experiment Farm.

SHEEP and wool research at Trangie Experiment Farm is to be speeded-up during the next twelve months. A wool laboratory and additional yards for hand serving, mothering, etc., are to be built to assist research workers of the Department of Agriculture in their search for knowledge calculated to raise the general standard of wool production and so place the industry in a better position to compete successfully with synthetic fibres.

"High cost of production, to which blowfly losses contribute largely, is perhaps the biggest handicap under which the wool industry is likely to labour when the fight for survival against synthetic fibres becomes intense," said the Minister for Agriculture, Hon. E. H. Graham. "The aim of research workers at Trangie is to breed plain-bodied sheep of good conformation, which will carry the maximum amount of even quality wool, and also be less liable to blowfly strike on both breech and body."

Trangie Experiment Farm was favourably situated for carrying out scientific sheep breeding and wool research work, said Mr. Graham. The farm had a flock of approximately 4,000 Merino sheep of Bundemar origin, a small flock of breeding ewes of pure Saxony origin and a line of Corriedale sheep.

A veterinary officer of the Department of Agriculture, who was specialising in genetics, was stationed at Trangie for the purpose of carrying out progeny testing work, wool research and other studies under the direction of the Director of Veterinary Research.



RAINFALL IN NEW SOUTH WALES

(Published Quarterly)

(a) GRAPH SHOWING DIVISIONAL MEANS EACH MONTH FOR 1945 AND 1946 COMPARED WITH THE (b) AVERAGES FOR ALL YEARS.

NOTES:

Graph based on data supplied by Sydney Weather Bureau.

(a) "means" are averages of rainfall recorded each month at selected centres in each particular division.

(b) "averages" represent the normal rainfall or an average of the recorded monthly means for all years.

Current year's rainfall shown thus: ; and the figures so represented (in points) are indicated in the schedule below:

MONTH 1946	DIVISIONS NC	HM	M	SC	NT	CT	ST	NWS	CWS	SWS	NCP	CP	R	WU	WL.
JAN	389	176	89	231	635	235	275	438	264	274	424	185	205	219	274
FEB	1005	266	264	313	313	293	386	132	200	381	116	214	426	135	367
MARCH	1244	775	323	236	473	158	200	124	145	232	56	153	121	60	85

Prepared in the Division of Marketing and Agricultural Economics, Department of Agriculture.

H. J. Hynes
Chief of Division

Compiled J. Williams
Drawn E. H. Bonner

The Artificial Insemination of Livestock

Advantages and Disadvantages.

W. L. HINDMARSH, B.V.Sc., M.R.C.V.S., D.V.H., Director of Veterinary Research.

AS with all new developments in farm practice, artificial insemination is viewed with some misgivings by many breeders. Many adverse but unfounded statements and opinions not supported by evidence have been advanced to condemn this method of breeding. There is, however, nothing inherently wrong with the method, which is carried out in accordance with the principles of animal physiology. On the contrary great benefit has been claimed as a result of the practice in those countries where artificial insemination has been widely carried out.

Experience at the artificial insemination centre which has been established at Glenfield during the past twelve months has, however, indicated that in Australia, where the herds for the most part contain twenty or more milking cows and thus there is need for at least one bull to each herd, artificial insemination will find its greatest use in making available to studs the service of an outstanding sire, or in the supply of semen from a high-class sire to farmers who cannot afford to purchase such a sire themselves. In the latter case, it will be necessary to reduce the cost of insemination per cow, before farmers will adopt the method.

There is, however, another important aspect of this matter. Sterility is a cause of much loss of production in our milking herds. If an advisory service on disease of the breeding organs could be given concurrently with the insemination service the high cost of the service would be justified.

Ever since man has attempted to improve his flocks and herds it has been recognised that certain male animals have had the ability to impress their characteristics upon their offspring, and from the earliest times breeders have made wide use of such animals in their endeavours to raise the standard of their stock. However, the value of that method was naturally restricted by the fact that the number of progeny that could be sired by any one male was limited by the number of matings that could be made during his life.

The First Calf Produced by Artificial Insemination at Glenfield Veterinary Research Station.
Born, 17th November, 1944.

Development of the Method.

After the revolution in Russia and the establishment of the Soviet regime, the government there was faced with the problem of improving the native flocks and herds with comparatively few high class males. Since so few good sires were available, Soviet scientists were given the task of developing a suitable technique for making maximum use of these animals. They made use of artificial insemination. The Soviet workers did not discover this method of breeding because Arab horse breeders are said to have used it in a crude way in the thirteenth and fourteenth centuries, and an Italian reported successful artificial insemination of dogs in the year 1780. However, they did place the method on a scientific basis and developed the modern technique of collecting, storing and using the semen.

The example set by Russia has been adopted in other countries, notably Denmark and the United States of America. As a result of the now world-wide interest, many advances have been made in our knowledge. In Russia the work was planned as a State undertaking on an immense scale. The following figures illustrate this:—In 1930 the number of cows artificially inseminated was 20,000 but in 1938 the number had grown to 1,200,000. One bull was mated with 1,536 cows which produced 1,490 calves. In all, in 1938 it was claimed that 50,000,000 farm animals had been inseminated.

In Denmark it is stated that there are eighty insemination societies which provide semen for 200,000 cows, and in the United States of America, in 1942, there were said to be sixty-four insemination associations each with a membership of over 1,000 cows.

In Russia the work is controlled and carried out by State employed officers. In Denmark and the United States of America, the herds are mostly small—so small as to not justify the keeping of a bull on every farm. Hence it is easy to understand why artificial insemination made rapid headway in those countries.

The Procedure in Artificial Insemination.

Artificial insemination consists of the introduction of semen into the breeding organs of the female with instruments, whereas in natural insemination the semen is ejaculated into these organs by the male at service. In natural breeding some millions of sperms are introduced into the vagina and mouth of the womb of the female. Only a small proportion of these actually gain access to the womb, and only one fuses with and fertilises the egg in the female organs. Artificial insemination makes use of this fact by spreading the semen of one ejaculation over a number of animals.

The procedure is as follows:—

1. *Collection of Semen from the Male.*—A number of methods of collecting semen have been devised, but that usually adopted is carried out by means of an artificial vagina, which is so constructed as to reproduce in it the conditions of the natural vagina. It must, therefore, have the temperature of the animal body and the inner

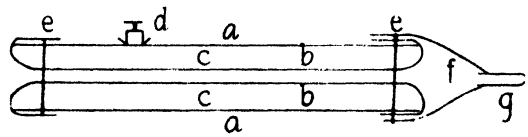


Diagram showing Construction of Artificial Vagina.

a.—Outer cylinder.
b.—Inner sleeve.
c.—Compartment for hot water.
d.—Filling aperture.
e.—Rubber bands retaining sleeve in place.
f.—Rubber funnel.
g.—Phial for collecting semen.

lining must be moist and smooth. The artificial vagina usually employed consists of an outer cylinder, with a port for the introduction of warm water, an inner lining of soft rubber and a vessel to collect the semen (see diagram). Warm water is poured through the port so that the space between the outer cylinder and the rubber lining is filled.

Males must be taught to lead and trained to mount a female which is restrained in a breeding crush. As the animal is about to thrust, the penis is diverted to the artificial vagina. As soon as the act is completed the artificial vagina is turned up so that the semen collects in the glass container.

2. *Examination of Semen.*—The examination comprises measurement of volume, general appearance, and microscopic inspection for activity of the sperm, number of sperms present and health of the sperms. Semen which is not of good quality is discarded.

3. *Dilution of Semen.*—The diluting fluid most commonly used is a mixture of fresh egg yolk and phosphates. In this fluid the sperms retain their activity for many hours. However, the semen gradually depreciates on storage, and although successful insemination may be obtained with semen stored for six or seven days, it is the usual practice not to use it after 96 hours storage.

In the case of the bull from 4 to 5 ml. of semen are obtained at one collection. When added to three parts of the diluting fluid 12 ml. are obtained. Since 1 ml. is sufficient for one insemination, twelve cows may be inseminated from one collection. Much greater dilutions than one of semen to three parts of egg-phosphate medium may be made and successful insemination in experiment work has been claimed by some workers with semen diluted fifty times.

From the time of its collection and dilution until it is used, the semen must be kept cool by storage in the refrigerator and transport in suitably cooled containers.

4. *Insemination.*—The diluted semen, measured into single doses in small tubes, is taken to the farm. The animals to be inseminated must be in season. A speculum is passed in to dilate the vagina, and with a syringe the dose of semen is drawn into a small bore glass or ebonite tube which is then passed into the mouth of the womb. The diluted semen is then injected into the neck of the womb.

The Advantages of Artificial Insemination.

The advantages of artificial insemination may be summed up as follows:—

(1) The great advantage already referred, namely the extension of the use of high grade males by enabling them to sire many more young; with artificial insemination one bull has been reported to have sired 1,000 calves in one year, and one ram has been mated with over 500 sheep in one breeding season. By means of artificial insemination herds can be more rapidly improved than with natural mating, and the services of a good bull can be made available to a number of small farms, the owners of which cannot afford to pay a high price for a well-bred bull.

(2) It may enable breeding to be carried out with a good bull which, owing to accident or other cause cannot mate naturally.

(3) It enables progeny testing to be carried out more expeditiously.

(4) The regular examination of semen ensures that only semen of good quality is used, and thus delayed breeding due to male infertility is avoided.

(5) The spread of some diseases of the genital organs may be prevented.

(6) If the insemination is carried out by a veterinarian, the recurring service of cows affected with genital diseases and on this account sterile, is avoided.

(7) A dairy farmer need not keep a bull on his farm, and thus the cost of maintaining a bull, and the danger of handling a bad-tempered bull, are eliminated.

(8) Under suitable conditions semen can be transported long distances.

The Disadvantage is the Cost.

The disadvantage of artificial insemination at present is the cost. Items that contribute to the expense of the method are:—

(1) An insemination centre must be established at considerable cost. High-class bulls must be purchased, suitable yards, crushes and buildings erected, staff employed, and a motor vehicle for transport of the inseminating officer is necessary.

The sires used should be progeny tested so that the capacity to transmit good qualities is known; it is possible for a well-bred bull of good conformation to get progeny of mediocre quality.

The staff handling the bulls and carrying the insemination work must be trained, and must include a qualified veterinarian.

(2) The organisation of an insemination circle requires much work, as sufficient cows must be in the circle to justify the establishment of the centre.

Thus the cost of an insemination service may be high. The price per insemination in other countries is from 25/- to 30/- and may be as high as £2. The cost in New South Wales has not been determined, but an estimate based upon the working of the unit at the Glenfield Veterinary Research Station is being prepared.

PARTURITION OF FARM ANIMALS

Treatment of Abnormal Presentations

CONTRIBUTED by the DIVISION of ANIMAL INDUSTRY.

PARTURITION is a normal physiological process whereby a young animal is born. It differs from other such processes in that it is usually accompanied by some considerable pain and discomfort to the mother, and may even seriously endanger her life if complications occur, making completion of the act without assistance impossible. Under Australian conditions it is rarely necessary for assistance to be given to farm animals, but occasionally every farmer is called upon either to give such assistance, or to help a veterinary surgeon or another man to carry out such work. He therefore should have some knowledge of normal and abnormal types of birth and possible complications.

Anatomy of the Female Reproductive System.

In simple terms this system consists of the uterus or womb, which is a sack-like organ connected behind through a round muscular opening called the cervix, to the exterior by the vagina, which is a membranous canal also in connection with the urinary system, (Fig. 1). In front the uterus divides into two horns, which give rise to two narrow twisted tubes connected with the ovaries, which are suspended a little behind the kidneys in the abdominal cavity. The whole of this system is lined with a sensitive mucous membrane containing in parts numerous glands, which secrete fluid to lubricate the passage. The lining of the uterus is particularly adapted for the nourishment of the unborn animal.

The Approach of Parturition.

Termination of pregnancy is usually announced by various symptoms, varying according to the type of animal:—

1. The udder, especially in young animals, usually becomes swollen and tender and the swelling might even extend along the abdomen and between the thighs. Some milk is usually present at this stage, and in the mare, the teat becomes covered with a waxy coating two or three days before parturition.

2. Usually there is some discharge immediately before parturition, and this increases rapidly over the last few hours.

3. The conduct of the animal changes considerably, becoming quieter and sluggish. Usually she seeks a secluded spot, and some animals, such as the pig and the dog, actually prepare a nest.

Normal Parturition.

This varies considerably according to the type of animal, and it is of particular importance to recognise this fact.

1. *Mare.*—The process is extremely rapid and violent, usually being completed within 20 to 30 minutes of the first serious labour pains. If no progress has been observed within 15 minutes of commencement it is evident that something is wrong, and if possible a veterinary sergeon should be called in immediately, or if that is not possible, preparations for assistance should be made.

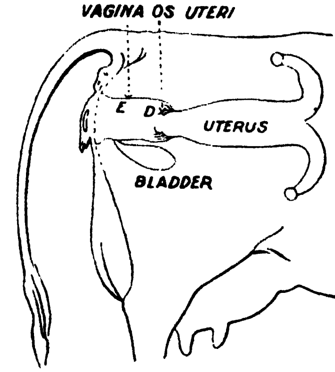


Fig. 1.—The Generative Organs of a Cow.

2. *Cow.*—Labour pains are not nearly so violent and the whole process is much more gradual. No anxiety need be experienced unless nothing appears to have developed after two or three hours of normal labour.

3. *Sheep.*—Parturition may be prolonged, especially if the young animal has died, even up to one day, but assistance is usually offered if a ewe is seen in difficulty.

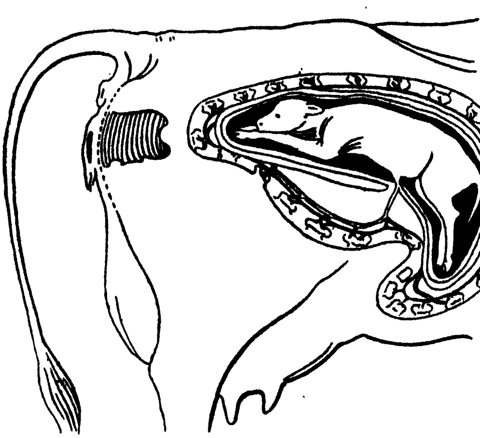


Fig. 2.—A Normal Presentation

4. *Sow.*—Assistance has seldom to be offered in this case. Although the process may be prolonged over several hours, usually it is completed within two hours, for normal-sized litters.

Normal presentation is anterior, *i.e.*, the fore limbs are usually presented with the head lying between them (Fig. 2), but sometimes posterior, *i.e.*, hind limb presentation is encountered and may cause slight difficulty. Sometimes slight irregularities occur and may cause trouble.

First the membranes surrounding the unborn animals appear at the opening of the vagina and these burst, discharging some of the fluid contents, which serve in part to lubricate the passage. Next the fore limbs appear, followed by the head. After the head appears, the animal usually relaxes for a brief period. Next severe contractions of the uterus, assisted by the abdominal wall and diaphragm, force the shoulders and then the body through the passage until birth is completed.

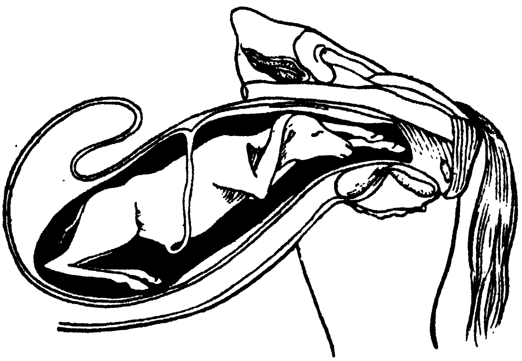


Fig. 3.—Head and Fore-limbs Presenting with one Fore-limb Crossed over Neck.

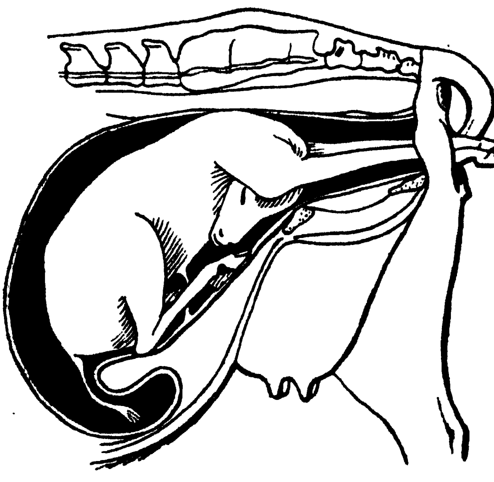


Fig. 5.—Fore-limbs Presenting Head Down Between the Fore-limbs.

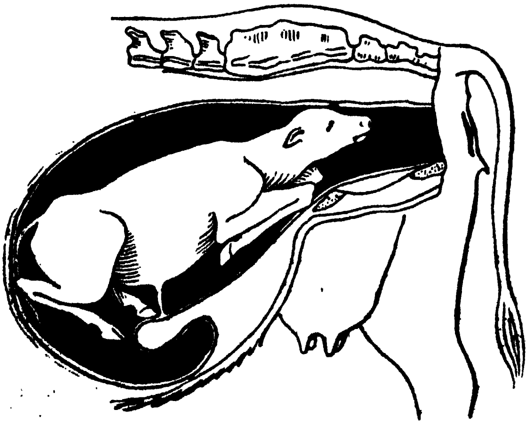


Fig. 4.—Head alone Presenting, Both Fore-limbs Retained, Bent at the Knees.

Abnormal Parturition.

Difficulty is encountered occasionally owing to abnormalities either of the foetus (unborn animal) or the mother. The foetus may be too large, may be malformed, or possibly twisted into such a position that the process is rendered difficult or impossible without assistance. Abnormalities of the mother are rarely encountered, but may be due to deformed bones in the pelvis, or simply to weakness or malnutrition.

Examination of a Difficult Case.

Let nature take its course as far as possible, and realise that undue interference may cause serious damage whereas often the animal, left alone, will come through quite safely.

1. *Precautions.*—As far as possible scrupulous cleanliness must be observed. This does not mean that strong disinfectants are to be used, as these are liable to cause far more damage than they are likely to prevent. The best preparation is to wash hands and arms thoroughly with soap and water, and to follow this by an application of, some non-irritant material such as paraffin or even some soft toilet soap and water.

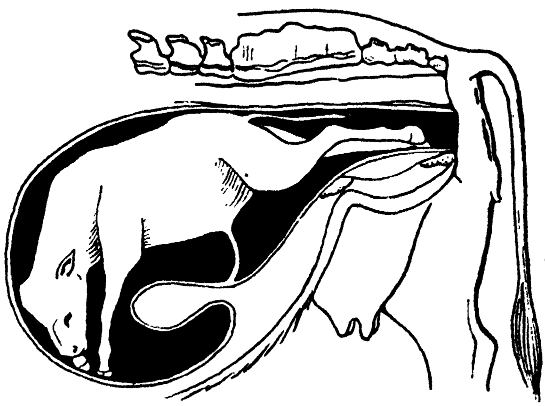


Fig. 7.—Hind-limbs and Tail Presenting.

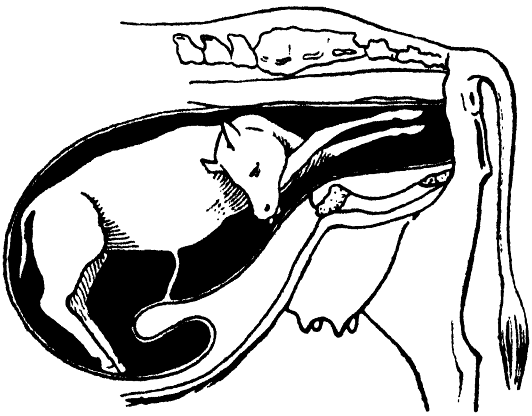


Fig. 6.—Fore-limbs Presenting, Head Back Resting on the Shoulders, the Neck against the Brim of the Pelvis.

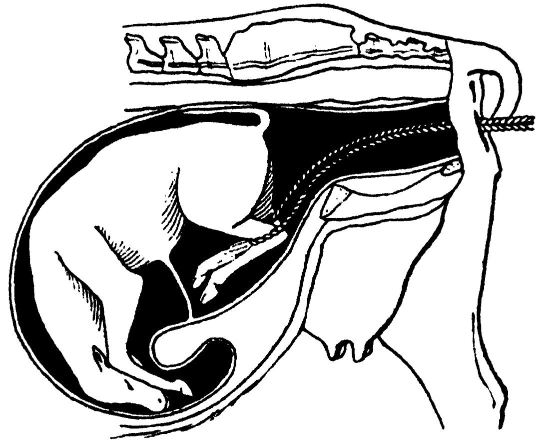


Fig. 8.—Hocks Brought on to the Brim of the Pelvis.

2. *Technique.*—Examination must be as rapid as possible, but should also leave the operator in a position to decide what treatment to adopt. Ascertain the type of presentation, size of foetus, whether the foetus is alive or dead, and make preparations according to findings. Always bear in mind that most cases must be treated as simply as possible as the operator becomes rapidly exhausted.

Instruments Required.

Soft cotton ropes about 10 ft. long, preferably flat with loops plaited at one end, two or three blunt hooks, and a knife of a type that can be used within an enclosed space, are usually required and should be kept on farms where such cases are likely to be encountered, should veterinary assistance be unobtainable. Before using these should always be sterilised by boiling for at least 20 minutes, although in urgent cases

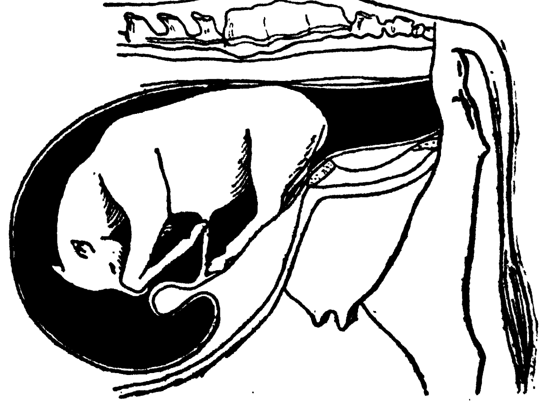


Fig. 9.—Thigh and Croup Presentation.

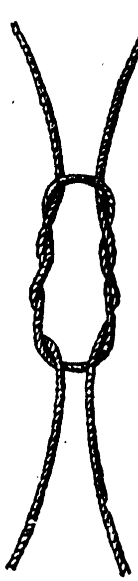


Fig. 10.—Truss to Fit Over Vagina.

this precaution may have to be neglected. These should therefore be kept in a clean or, preferably, sterile condition.

Treatment.

Head and fore limbs presenting, with one fore limb crossed over the neck. (Fig. 3).—

Attach ropes to jaw and free leg; push foetus from you; grasp fetlock of misplaced leg and work into normal position.

Head presenting, both fore limbs retained, bent at knee. (Fig. 4).—

Secure the head by passing a loop round the jaw, push foetus back, secure the legs one by one, grasping the hoof, and bringing the legs up to the right position, then apply gentle traction.

Fore limbs presenting, head down between limbs. (Fig. 5).—

Secure each limb by ropes, endeavour to rotate head up to normal position by grasping nose, applying loop to jaw, for assistant to pull, at same time pressing poll back.

Fore limbs presenting, head resting back on shoulders, neck jammed against pelvis. (Fig. 6).—

Secure limbs with ropes, rotate head by pressure applied to cord attached by loop to jaw, or blunt hook in eye cavity, at same time pressing back against chest.

Normal posterior presentation. (Fig. 7).—

Apply traction, if required.

Hocks caught on brim of pelvis. (Fig. 8).—

Repel foetus, if possible; bring up limbs one by one, bringing the hoof towards the mid-line, the hock being directed towards the flank of the mother.

Thigh and croup presentation. (Fig. 9).—

Push foetus forward by pressing upwards, and backwards, to convert to similar presentation as Fig. 8. Secure limbs and proceed as in previous case, keeping up the back pressure.

Points to be Observed in Treatment.

1. Call a veterinary surgeon if possible.

2. If compelled to carry out treatment, always observe scrupulous cleanliness. If any disinfectants are used, ½ per cent Lysol or some of the proprietory non-irritant disinfectant is satisfactory. If all instruments are thoroughly boiled and cleanliness observed, the natural defences of the body will be much more effective than any disinfectant.

3. The foetus should be withdrawn with as little damage as possible to the mother. To this end it is of great importance that the position of the various limbs be ascertained before exerting traction. Thus a simultaneous pull at a fore limb and a hind limb both presenting may lead to serious complications without assisting the case.

4. Traction should be as gentle as possible and timed to assist the normal contrac-

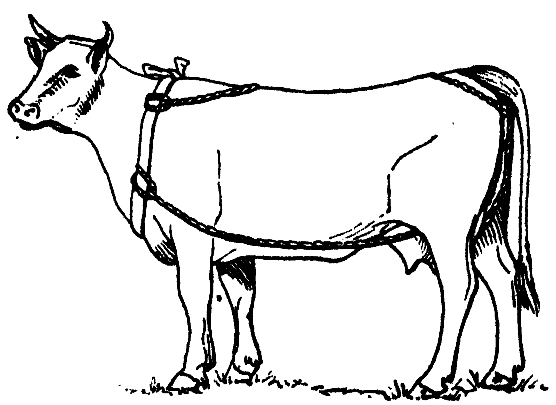


Fig. 11.—Method of Applying Truss.

tions of the uterus. The foetus should be pulled down towards the hocks of the mother rather than straight behind.

After Treatment.

1. Having delivered the young animal it is probable that there is considerable infection of the genital tract where interference has been necessary. Therefore this should be washed out thoroughly, preferably with a solution containing one tablespoon of salt to the gallon of water.

2. Where the animal is weak a stimulant should be given. A good stimulant for a cow consists of Epsom salts 1-lb., carbonate of ammonia 1-oz., powdered nux vomica 3-drams. This should be dissolved in one to two pints of water and given as a drench. Such a powder may be kept in packets and used as required.

3. It is advisable to take the temperature of the animal for several days. Any rise in temperature usually indicates some inflammatory condition of the genital tract, which should be attended to immediately.

Complications.

Metritis, or inflammation of the uterus, occurs occasionally and may cause death quite rapidly. This is usually accompanied by loss of appetite, rise in temperature and a discharge from behind.

To treat this condition, irrigate the uterus with a salt and water solution frequently until the returning fluid is clear. Give a stimulant drench, and if the weather is cold have the animal rugged.

Retention of the After-birth.—This is most frequent in cows, although occasionally seen in mares. If the mare has not cleaned within a few hours it is usually best to remove the membranes immediately. In a cow, however, they may safely be left for two days. Great care must be exercised in this operation as any rough handling may lead to serious results. The membranes should be "peeled" off the maternal cotyledons carefully. Removal should be followed by washing out several times as in treatment of Metritis.

Other Complications.—The bladder or uterus may become everted, and unless replaced may cause the death of the animal. Where possible this should be replaced as gently as possible after washing off adhering dirt, hair, etc. Recurrence is prevented by a clamp or stitches in the vulva. It is best however to call a veterinary surgeon in such cases.

Short Courses in Pig Raising.

To be held at Hawkesbury Agricultural College.

A SCHOOL of instruction for pig raisers is to be held at Hawkesbury Agricultural College, Richmond, from 9th to 12th July next, inclusive.

In announcing this decision the Minister for Agriculture, Mr. Graham, stated that the holding of the school had been arranged as part of the Department's general policy towards improving the standard of quality in the pig-raising industry.

The school aims to provide a short course of training in general pig raising, including specialised instruction in the judging of pigs alive and in carcase form. The course will be open to persons actively engaged in pig raising. It is specially adapted to the requirements of persons of mature years, and intending students must be over sixteen years of age.

No examination is required for entrance to the course, the fee for which is £1 5s., which will cover both tuition and board and lodging. Persons travelling by rail will be able to obtain return tickets at the usual concession rate of single fare and one-third.

Application forms and syllabus are obtainable from the Under Secretary and Director, Department of Agriculture, Box 36A, G.P.O., Sydney, with whom applications, accompanied by the necessary fee, should be lodged as soon as possible, but in any case not later than by 11th June.

Bowraville Free of Cattle Tick—Restrictions Removed.

BOWRAVILLE Area is free of cattle tick, and all restrictions imposed because of the outbreak in that Area in December, 1944, have now been removed.

Announcing the lifting of the restrictions the Minister for Agriculture (Hon. E. H. Graham, M.L.A.) said that since the infestation was found, all stock over a wide area in the Bowraville District had been searched repeatedly, and stock on infested and in adjoining holdings had been treated at fortnightly intervals. No further cattle tick infestations had been found, although ticks of other types were present in large numbers. It was satisfactory said Mr. Graham, to know that this unusual spread of cattle tick had been effectively dealt with.

Bran, Pollard and Oats for Stock Feeding.

THE world food situation makes it necessary to reduce to the minimum the consumption of wheat by stock. The New South Wales allocation of wheat for stock feed has been reduced from 10,00,000 to 7,500,000 bushels. A record crop of 8,000,000 bushels of oats and the by-products of three-shift flour milling must provide the feed to replace wheat urgently needed for human consumption overseas.

Oats, bran and pollard can best be used to replace wheat as follows:

For poultry, whole oats can form half of the grain ration, or ground oats one-third of the mash, while bran and pollard can, if sufficient is available, wholly replace wheatmeal in the mash.

For pigs, well ground oats can replace up to half the wheat for pigs which are past the weaning stage, and pollard can also be used to a large extent. Pollard, in addition to replacing wheat, will help to supplement the meatmeal, as it is considerably higher in protein than wheat.

For dairy cattle, crushed oats and bran and pollard can efficiently replace all the wheatmeal.—G. L. MCCLYMONT, Veterinary Officer.

It Pays to Feed Dry Cows.

ON many dairies cattle are brought straight from the dry paddocks, often the poorest on the farm, without any attempt to build up condition to fit them for the strain of milk production. Good production cannot be obtained from such stock. Unless cattle are in good condition at calving, that is, with reserves of fat and protein built up during the dry period, milk production will never reach a high level. This is due to the fact that many cattle cannot eat enough feed for the high production of the first few months after calving, and must draw on body reserves. If these reserves are not available, milk production cannot reach its maximum. Also, there is more tendency to digestive disorders if, when hand-feeding, cattle are brought straight from poor feed on to a ration containing, perhaps, a large proportion of concentrates.

A good general recommendation where cattle are not on first-class pasture is for the dry cows to be given 5 lb. of concentrates per day for six weeks before calving, in addition to a full feed of roughage. The food thus invested in building up the cattle is far from wasted. It usually pays for itself several times over. For example, 5 lb. of oats per day for six weeks before calving would take 15s. worth of oats at 3s. a bushel. An increase of only 20 gallons of milk over the lactation at 9d. a gallon or only 10 gallons at 1s. 6d. per gallon is required to pay for this feed. By building up cattle in this way before calving, an increase of from 100 to 300 gallons over the previous lactations can be obtained.

"Feeding for Milk Production," the recently issued 32-page pamphlet from which the foregoing paragraphs are taken, is obtainable free on application to the Division of Information and Extension Services, Department of Agriculture, Box 36A, G.P.O., Sydney.

Supply of Superphosphate.

WITH the exception of essential reserves for vegetable growing and for the use of returning ex-service personnel for rehabilitation purposes, the supply of superphosphate made available for distribution in New South Wales this season by the Commonwealth Government has now all been taken up. It will not, therefore, be possible to consider further claims for supplies of superphosphate from the Contingencies Pool for cereal growing, pasture top-dressing and similar purposes, nor for supplies for the growing of fodder for dairy cattle, pigs and poultry in inland areas, and for irrigated pastures, except those from recently discharged servicemen.—H. O. BENNETT, N.S.W. Fertiliser Rationing Officer.

Feed Flavours in Milk.

FEED flavours are produced by strong smelling or tasting materials being absorbed from food in the gut and excreted in the milk. As this process usually only lasts for a few hours after the food has been eaten, feeding immediately after milking will usually leave no taint at the next milking. Cabbage, turnips, onions, garlic, rape, kale, lucerne, clover, silage and carrot weed are the commonest materials to be watched in this respect. The absorption of feed adours from the air is rarely to blame for tainted milk.

THE BREEDING AND FATTENING OF LAMBS

On Irrigation Areas.

K. R. HOWE, Senior Sheep and Wool Instructor.

(*Concluded from page* 176.)

THIS article was commenced in March issue and was continued in April. To date the author has dealt with the general requirements of the proposition—water, pastures, fodder—the choice of breeds of sheep, and such aspects of husbandry as carrying capacity, methods of grazing, etc.

In this issue he discusses the fattening of lambs under irrigation and the problems of marketing.

Fattening Problems.

Fattening, or "topping up" for market, is in many cases, disappointingly slow on irrigation pastures. Generally speaking, little difficulty is encountered in this direction during the summer months and the greatest difficulty is experienced during the winter.

The problem of fattening, ironically enough, concerns sheep breeders on the intensive systems of irrigation such as the Murrumbidgee Irrigation Area more than those on the Murray Valley schemes. In the case of the Murrumbidgee Irrigation Area there is, generally, very little grazing to be had from "dry areas" and, where this is available, it is usually some miles distant from the irrigation block. Consequently the sheep are for the most part dependent on irrigated pastures and crops.

Whether stricter attention must be paid to the control of internal parasites, pasture management, possible nutritional and mineral deficiencies or combinations of all four, remains to be discovered, and comprehensive research along these lines is desirable.

From observations made over a wide field the problems of unsatisfactory fattening appear to be bound up with parasitic infestation and nutritional deficiencies. Most experienced sheep breeders adopt routine drenching with approved drugs to control internal parasites, as they find that rapid fattening of suckers or stores is well nigh impossible without first carrying out a drenching programme. Many lamb raisers have observed beneficial results from supplementary feeding coupled with drenching. Ewes and lambs are allowed access to chaff and grain by means of a self-feeder or baled lucerne, pasture or cereal hay, per medium of racks.

The advantages derived from supplementary feeding may be summarised as follows:

(1) In conjunction with pastures it provides a balanced diet (balance between protein and carbohydrates, also a balance between food units and roughage) and promotes a healthier tone in the digestive system.

(2) It builds up resistance to internal parasites, and cuts down the number of drenchings.

(3) Sheep are less susceptible to enterotoxaemia.

(4) It promotes maximum fattening rate.

(5) It produces a firmer handling lamb, which carries better and consequently reaches the market in far better condition than lambs off pasture.

(6) Lambs which have lost their mothers, stand an almost equal chance, with the rest of the flock, of maturing to marketable weights.

(7) It seems to sustain the lambs over "dry" periods when the milk supply from the ewe is reduced and they would ordinarily receive a severe check.

On one holding the writer observed the results of regular yarding (alternate days) of the flock and drafting off of the lambs to allow them access to the self-feeder without competition from the adult sheep. The owner claimed that the better finish and earlier maturity of the lambs fully justified any time involved in mustering and drafting.

Lambing Schedules.

By mating on green pasture it is possible to have crossbred ewes lambing by 1st April. It is asking too much for a late dropped sheep to mate and lamb early, but providing particular care is observed in selecting the type of breeding ewe it will be possible to lamb them down as early as April. Many irrigationists have experienced difficulty in this respect, but in nearly every case the ewes were bought from a cold (late) district.

Some breeders have found that a percentage of the ewe flock will lamb early and the balance a month or so later. Some even exploit this to "stagger" the lambing. The earliest dropped lambs are marketed by the time the latest have dropped, thus spreading the strain on the pastures.

It has been proved that it is possible to produce three lambings in two years in fat lamb districts outside the irrigation areas, and it should be possible to organise such a programme under irrigation conditions.

The summer lamb (*i.e.*, the lamb dropped in the spring) has not been fully exploited, but very good returns have been received for crossbred lambs bred that way.

Marketing.

Comparatively short matings (six weeks) mean shorter lambings and with good pasture available lambs should be reasonably uniform by the time they are fit for market.

The age of the lambs at marketing will be determined largely by the early maturity of the breeds used and the weight of carcase which will give most satisfactory returns.

Early-maturing lambs by Dorset Horn rams out of half-bred ewes (averaging, say, 37 lb. dressed) should be ready for market by about sixteen weeks. Under very favourable conditions the age at marketing might be as low as twelve weeks. Slower maturing lambs might take up to five months to finish. The export market requires the lighter type of carcase—consistent with quality—say from 32 to 36 lb. when dressed. This means that the lambs should be marketed when the live weight is between 65 and 72 lb.

The home consumption demand is becoming more descriminating, favouring also, a lighter carcase (smaller joints) than in the past. Many butchers do not like to handle lamb carcases of over 40 lb.

Lambs at a Self-feeder.

The owner claims that access to the self-feeder without competition from adult sheep results in better finish and earlier maturity in the lambs.

Quality and correct weight are, therefore, most important considerations, when arranging for consignments.

Lambs should be marketed in small, uniform lots rather than large consignments of irregular weights, shapes and sizes.

Where possible, the irrigationist should arrange for his lamb drop to occur before or after the season during which men in the better and longer established districts market their lambs. Happily, this can be arranged by revision of management methods and actually does occur, particularly from irrigation areas in earlier districts. With the provision of sufficient pasture it should be possible to regulate production by timing lambing and maturity to strike the markets during the periods of comparatively short supply.

This would have the effect of extending the existing marketing seasons, reducing marked fluctuations from peaks of production to periods of scarcity, and affording better prices of a more stable nature for all concerned, thus bringing the industry one step nearer to the much desired continuity of supply.

Health of Stock.

Whilst it will be readily appreciated that stock on the high plane of nutrition made possible by irrigated pastures, should grow up "sound in wind and limb," it should also be obvious that in the event of an outbreak of disease or parasitic infestation, because of the high concentration of stock possible, much more trouble might be experienced on irrigated pastures capable of carrying 8 to 10 sheep per acre, than on ordinary natural pastures (rated at 1 sheep to 2 acres). Furthermore, the damp conditions encourage the development of germs and parasites. The position has been very aptly phrased by one writer—"Permanent pastures perpetuate parasites."

Many men subscribe to the idea that ample feed off-sets the effects of worms, but it would be more correct to say that the effects of worms off-set the benefits derived from ample feed.

Those interested in irrigation lamb raising should discuss this aspect of their undertaking with their District Veterinary Officer or Stock Inspector. He will advise what diseases and worms to expect and the means of preventing or controlling them. The breeder should make it his business to be prepared for any contingency in this respect.

Conclusions.

Successful sheep raising on irrigation areas depends on a number of factors, the chief of which are:—

(1) Wise utilisation of water;

(2) Correct management of pastures;

(3) Maintenance of a high quality breeding stock.

(4) Provision for the production of fodder crops and the establishment of fodder reserves for drought insurance and supplementary feeding.

(5) Adjustment of flock management methods to suit irrigation conditions.

(6) Maintenance of sound health of stock.

Noxious Weeds—Revision of Gazetted Lists.

A COMPLETE overhaul of the noxious weed problem throughout New South Wales has been planned by the Minister for Agriculture Mr. Graham. All Shires and Municipalities have been grouped for the purpose of holding group conferences to revise present schedules of noxious weeds.

"Unfortunately, during the war years," said Mr. Graham, "it was impossible, owing to lack of staff, to give much attention to weed control. With the return of the Weeds Officer to the Department, however, a concerted effort is being made to catch up some of the leeway. I am anxious that uniform action be taken in all Shires and Municipalities on the question of gazettal of noxious weeds. Local Government bodies have been grouped and officers of my Department and of other interested Departments will confer with each group in order to revise the schedules of noxious weeds."

Recent group conferences at Warren and Bathurst had been highly successful, said the Minister.

Chick Sexing Examinations.

PROVIDED sufficient applications are received, it is intended to hold another chick sexing examination on 21st May. Those desiring to attend should make application to the Department of Agriculture, Farrer-place, Sydney.

It is expected that further examinations will be held later in the season, but this will be dependent upon the number of candidates offering.

Treatment of Warts on the Udder.

WARTS, which are really small tumours, occur frequently on the udder and teats of the cow. They are seen more often in young than in old cattle. There is some evidence to indicate that they may be infectious. When numerous, they make the process of milking difficult, and as a result of the friction, particularly in stripping, they may result in sore teats.

Warts are of different shapes; some are rather long and have a distinct neck; others are flattened, whilst others again are cylindrical in shape. Sometimes they will disappear spontaneously, but usually treatment is necessary.

Treatment is preferably carried out when the cow is dry. Actual removal by surgical methods provides the best means of treatment. Where the warts are of such a nature as to be easily snipped off with scissors, this can be done by the farmer himself. After washing the teat to remove all dirt, it should be immersed in a vessel containing weak disinfectant for some minutes before the operation is carried out. Bleeding is usually slight and may be controlled by the application of "white lotion," made up of ¾ oz. sulphate of zinc, 1 oz. acetate of lead, and 1 pint boiled water. A white deposit will form in the bottle when it is allowed to stand. The bottle should be well shaken before the liquid is used. For safety the bottle should be labelled "Poison."

Where warts are flattened and extensive, the operation should be carried out by a veterinary surgeon.

The application of various medicaments will frequently remove warts without recourse to surgical means. For this purpose castor oil applied several times daily, caustic solutions, and acids have been used with success. When strong caustics or acids are employed a ring of vaseline should be placed round the wart so that the material applied will not spread and scald the surrounding skin. Treatment of warts by the application of the preparations mentioned requires perseverance, since removal in this way is slow.

Curing of Hides.

BEFORE salting, hides and skins should be allowed to lie for a few hours after flaying in order to cool thoroughly. Salting, however, should always take place within a few hours of death, otherwise the leather produced shows definite loss of quality. It is very important that the hides and skins be in a clean condition, since the presence of blood, dirt and manure checks the penetration of the salt and also encourages bacterial growth with subsequent damage.

Salt used for curing must be fresh, clean and free from earth and dirt; salt which has been used before will not give the best results. The hides should be laid out with the fleshy side upmost in a cool, clean place and evenly and liberally sprinkled with salt. It has been found that hides need salt in amount equal to one-third of their butcher's weight. Calf skins may require up to one half their weight of salt.

If it is intended to keep skins on hand for any length of time it will be necessary to spray or paint them with an arsenical preparation in order to prevent the ravages of weevils or other vermin. A satisfactory spray can be made by adding 1 lb. arsenic and 3 lb. soda to 5 gallons of water, and then boiling the mixture; when dissolved make up to 15 gallons of water. If preferred, arsenite of soda, procurable at most country stores, may be used in the strength of 1 lb. to 5 gallons of water.

Another preparation can be made in the following way:—Dissolve 1 lb. arsenite of soda in 5 gallons of cold water; place 1 lb. bitter aloes in 2 gallons of water and boil until the aloes are properly dissolved, and add 1 pint of the aloes mixture to every 5 gallons of the arsenite of soda mixture. The spray is then ready for use.

Any preparation should, of course, be painted on the fleshy side of the skin.

Farmers and Veterinary Services.

IT is important to the farmer that professional services regarding the health of stock should be undertaken by persons properly qualified to perform such service, points out Mr. H. M. Shaw, Acting Registrar of the Veterinary Surgeons Board. Registration of practitioners under the Veterinary Surgeons Act, 1923, constitutes a safeguard. Only persons of an approved standard of competence are registered, and only those who are registered may legally practise as veterinary surgeons.

For practising professionally although unregistered, a person was recently proceeded against by the Board at Albury, and fined £3 with costs. Other recent succesful prosecutions by the Board concerned the use of the letters "B.V.Sc.", denoting a qualification in veterinary science to which the veterinarian who employed the letters was not entitled.

FEEDS and FEEDING NOTES.

Contributed by

The Division of Animal Industry

THE NUTRITIONAL REQUIREMENTS OF POULTRY.

Practical Application of Results of Research.

(*Continued from page* 166.)

G. L. McClymont, B.V.Sc., Veterinary Officer.

Facts and Figures on Feeding Poultry.

NUTRITIONAL requirements and practical feeding have now been discussed. In this section, the writer gives some useful data on feed consumption, discusses the use of grit, and two diseases related to nutrition, namely, cannibalism and gizzard erosion.

Food Consumption.

Food Consumption per 100 *Chickens.*—

Weeks after Hatching	*100 Chickens will eat.*
1st week	...10 lb. feed.
2nd week... ...	...20 lb. feed.
3rd week... ...	...30 lb. feed.
4th week... ...	...40 lb. feed.

Total Food Consumption.

To 4th week ...	...100 lb. of feed.
To 8th week ...	...360 lb. of feed.
To 12th week ...	...760 lb. of feed.
To 24th week ...	...2,500 lb. of feed.

The feed required to rear one pullet from a day old to laying (approximately six months) is 25 lb.

The feed (mash and grain) per hundred hens per day averages 25 lb. plus green feed.

Egg Production and Feed Economy.—The average egg production for New South Wales is about 140 eggs per hen per year. By sound breeding methods, it is possible to increase production to an average of 200 eggs per hen per year and, at the same time, reduce mortality and maintain egg weight and hatchability. The effect of this improvement in production on the economy of food utilisation is obvious from the following figures:—

Egg Production per Hen per year.	*Total Feed per Hen per year*	*Feed Per Dozen Eggs.*
80	71	11
120	75	7
160	78	6
200	82	5

The saving in feed from culling low producers and breeding for high production is evident. A hen laying 80 eggs per year requires over twice as much feed per dozen eggs as a hen laying 200 eggs per year. As feed costs are the greatest single production cost, the improvement in returns from efficient culling and application of sound breeding principles is one which should be kept in mind at all times.

The Effect of Restricting Feed Intake.—Good, well-balanced feed is not enough. It must be fed in sufficient quantities. There is a tendency when feed is short or the price of eggs low, and feed high, to restrict the amount of feed, in the hope that, although fewer eggs might be laid, the profit will be greater because of reduced cost of feed. However, American experiments have shown that reducing feeding take below the amount eaten when the birds have free access to it, results in lower egg production, greater amounts of feed per dozen eggs, and hence lower net profits.

The fear of over-fattening birds with too much feed is unfounded. Birds which do become overfat in the laying season are either naturally low producers which are turning the feed into fat instead of eggs, or birds which are not getting a ration sufficiently high in protein to allow maximum egg production.

Reducing food intake to seven-eighths of the amount eaten when given free access, resulted in a decrease in the number of eggs per hen from 182 to 124 per year, and increased the amount of feed per dozen eggs from 4.4 to 5.6 lb.

Full Feeding Pays!

Shell Grit.

The hard pieces of grit found in the gizzard of fowls should be distinguished from shell grit. Shell grit is primarily a source of calcium, but is soluble in the digestive juices and does not stay long in the gizzard. The indigestible grit found in the gizzard is required by the birds for most efficient digestion of coarse feed. That it is not absolutely essential has been shown by rearing birds with no grit. They have been kept in normal health and production over long periods, and the efficiency of feed utilisation has been equal to that of birds with grit, provided well ground feed was given. However, with coarse feeds and whole grain, birds provided with grit showed better digestion.

It is good practice to provide some grit such as gravel or hard granite in addition to shell grit if the birds cannot get sufficient from the ground.

Cannibalism.

Cannibalism is the vicious habit of picking toes, combs, feathers and vents. Once it starts in a mob of chickens or adult birds, the habit may quickly spread, and is frequently difficult to eradicate.

The condition may vary from a mild feather picking in adult stock with few or no losses, to severe vent picking in chickens with heavy losses.

Suggested Causes.—There is no single cause of the habit. Factors which have been indicated at various times are:—

(1) Overcrowding, such as running too many chickens in the brooder, especially if it results in inadequate eating and drinking space, or failure to reduce numbers of birds in a pen as they grow.

(2) Idleness, caused by pellet or all mash feeding and absence of litter, giving birds more idle time in which they might develop the habit.

(3) Insufficient bulk in the ration. It is sometimes noted that where rations are largely made up of grain or grain meals with little or no fibrous feeds, such as oats or bran, cannibalism develops.

(4) Deficiency of protein, especially caused by shortage of meat meal, has been considered to be a cause in some cases.

(5) Insufficient salt in the ration has also been considered to be a cause.

Control Measures.—Where cannibalism occurs, control measures along the following lines may be tried:—

(1) Remove birds which have developed the habit.

(2) Provide a self-feeder containing whole oats (this may be done from as young as six weeks of age), or include up to 30 per cent. of ground oats in the mash.

(3) Bring the salt content of the ration up to 2 per cent. on an all-mash ration, or 3 per cent. in the mash in a mash-grain ration.

(4) If possible, increase the meatmeal content of the ration.

(5) If overcrowded or with no range, reduce the over-crowding or allow access to range.

(6) If in a brooder house, check the temperature and see that it is not too high.

(7) If the cannibalism is severe and the above measures are of no use, put red cellophane screens over the windows of the brooder. This gives a red tint to the whole of the birds and prevents birds paying attention to the red vents.

Gizzard Erosion.

In this condition, which is very common in young birds, the normal yellow gizzard lining may appear rough or frayed, or may be absent, leaving a black or brown area. The cause appears to be dietary in origin, as different rations will produce different amounts of gizzard erosion.

The erosion starts as a small haemorrhage in the actual wall of the gizzard.

Whilst it is very common, it apparently does not usually affect the growth or mortality rate in chickens. However, in some outbreaks of coccidiosis and similar diseases, there has been found to be a higher percentage of deaths than would be expected from the coccidiosis, etc., alone, and in these cases the gizzard erosion is suspected to have increased the mortality.

Various nutrients have been suggested at times as being the factor necessary for prevention of gizzard erosion, but so far research has not defined which nutrients are really involved, so that little can be done as yet as regards prevention.

Preparing a Cow for Show.

THE first point to consider is whether the beast is to be shown in the "dry" or in the "in milk" class. If in the "dry" class, the cow should be mated so as to be within a week or two of calving at the time of showing. If in the "in milk" class, it is advisable to mate her so that she will have calved a week or two prior to show day. Mated in this way, the beast can be shown to best advantage, provided other particulars as to condition, etc., are attended to.

Work in preparation for showing should begin at least two months prior to the show.

Concentrate upon teaching the animal to lead, walk, and stand correctly, to become used to hand-feeding, drinking out of a bucket, and not to fret when tied up.

The animal should not be overfed, or fed with too much concentrates. The ration fed will depend on what fodder is available and the expense one is prepared to meet. Oaten chaff, bran, crushed oats and linseed meal, together with lucerne hay, are ideal fodders to feed when preparing a beast for the show. The amounts fed will depend on the size of the animal and the quantity she will consume without getting too fat. The addition of linseed meal aids in the preparation of the coat.

About a week before the show, the animal should be clipped all over, except the brush of the tail and the forehead. When clipped, she should be rugged and groomed well. Do not overdo the washing of a beast for show. A few days before the show the horns may be scraped with a piece of glass bottle, and then smoothed with emery paper or whiting paste. As a final polish, rub the horns dry and apply an oily cloth (olive oil).

Have a clean, attractive-looking halter to lead the beast around the ring, and concentrate your attention on making your beast show herself to the best advantage. "Showmanship" is everything when taking up the showing of cattle seriously. C. G. F. GRANT, Herdmaster.

Grazing of Kikuyu Grass.

CATTLE should not be grazed on kikuyu grass until it is properly established. If it is fed off too early there is a likelihood of them tearing up the young runners.

Kikuyu grows well on almost any class of land in all our dairying districts, provided the soil is loose enough to enable the runners to develop rapidly and become well rooted. It forms a good, dense pasture, is useful in the control of soil erosion, and an effective smotherer of bracken fern and other weeds. Planting on land that is to be used for cultivation at some future date is not recommended, as once the grass is well established it is difficult to eradicate.

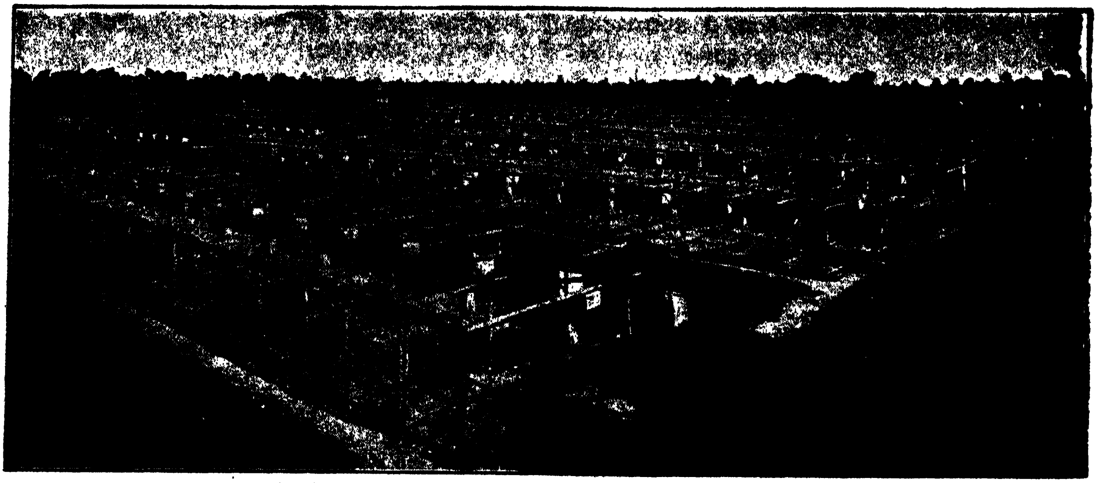
A pamphlet on kikuyu grass is obtainable free on application to the Division of Information and Extension Services, Department of Agriculture, Box 36A, G.P.O., Sydney.

Agricultural Societies' Shows.

SECRETARIES are invited to forward for insertion in this list dates of their forthcoming shows; these should reach the Editor, Department of Agriculture, Box 36A, G.P.O., Sydney, not later than the 15th of the month previous to issue. Alterations of dates should be notified at once.

1946.

Albury Sheep Show (A. G. Young) August 6, 7
Condobolin (N. J. Hanlin) .... August 6, 7
Trundle (W. A. Long) .... August 13, 14
Peak Hill (C. McDowall) .... August 20, 21
Parkes (L. S. Seaborn) .... August 26, 27, 28
Forbes (J. T. Woods) .... September 3, 4
Manildra (E. S. Parker) ...... September 3, 4
Young (T. A. Tester) ....September 3, 4
Narrandera (T. L. Bull) ...... September 13, 14
Murrumburrah (R. J. Simpson) September 24, 25
Mangrove Mountain Agricultural Bureau (W. J. Mitchell) ...... September 28
Albury (A. G. Young) .... October 8, 9, 10



The Competition Pens at Hawkesbury Agricultural College.

Poultry Notes.

May, 1946.

E. HADLINGTON, POULTRY EXPERT.

Comments on the 1945-46 Egg-laying Competition at the Hawkesbury Agricultural College.

IN this years competition the general average production was 9.7 eggs per hen lower than last year, the comparative figures being 195.17 in this test against 204.8 last year. It is probable that the several changes in the ration fed to the birds, due to shortages of foodstuffs, had some effect on production.

The normal number of birds (540) competed, whereas, in the two previous tests only half that number of pens were made available.

The Breed Averages.

The averages of the different breeds, compared with last year, are shown hereunder:—

1945-46.

Breed	Average Egg Production.
360 White Leghorns	194.2
114 Australorps	200.5
48 Langshans	194.9
18 Rhode Island Reds	167.1

1944-45.

Breed	Average Egg Production.
180 White Leghorns	205.05
60 Australorps	203.31
24 Langshans	211.58
6 Rhode Island Reds	187.83

The Main Prize Winners.

As was the case last year, most of the major prizes went to one competitor. On this occasion the successful breeder was Mr. N. F. Judson, whose pen won the Grand Champion prize, for highest market value of eggs; the Golden Egg for quality and production; the James Hadlington Commemoration Medal for quality and weight of birds and weight of eggs, the Emily Robinson Memorial prize for the highest combined points for pullets in the laying competition and cockerels in the cockerel exhibition. He also won the prize for the highest individual score and a number of other smaller prizes. This meritorious performance follows upon consistent successes in previous

competitions, and is further evidence of skilful breeding.

In the light breeds section a new competitor, Mr. D. A. Cullen, won the Grand Champion Consolation prize, also the prize for the highest group score and other minor prizes He was unlucky to miss winning the Grand Champion prize, after leading in value of eggs up to the end of February.

Wimbleford Poultry Farm was again in the prize list, and won the Golden Egg Consolation trophy as well as a few smaller prizes.

Mr. R. Thoroughgood won the prize for the highest individual score, light breeds, one of his group having laid 274 eggs.

It was most unfortunate that the group of Chinese Langshans owned by Mr. H. Holyoake, which laid the greatest number of eggs, was disqualified on account of underweight eggs.

Full Report of Egg-laying Competition.

FULL details of the 1945-46 'Hawkesbury Agricultural College Egg-laying Competition are available in leaflet form and will be supplied on application to the Department of Agriculture, Box 26A, G.P.O., Sydney.

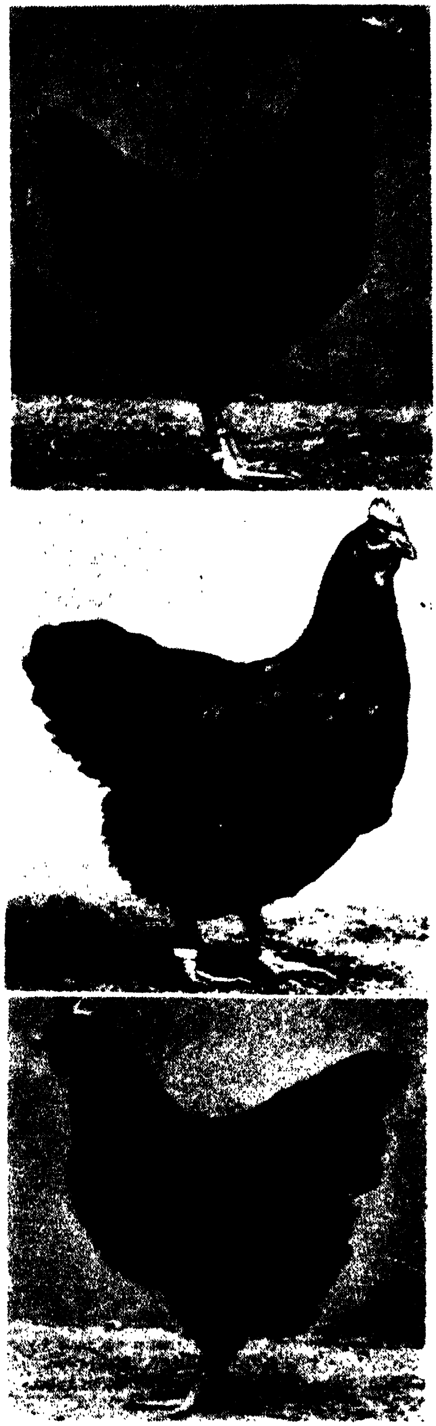
Lower Egg Weight.

It is regrettable that after an improvement in weight of eggs over the past couple of years there was a sharp decline in this test, as will be seen by the following figures:—

	Individuals.		Groups.	
	No.	per cent.	No.	per cent.
1945-46.				
Light Breeds	38 =	10.3	15 =	25
Heavy Breeds	32 =	18.0	10 =	33
1944-45.				
Light Breeds	9 =	5	3 =	10
Heavy Breeds	8 =	8.8	2 =	13.3
1943-44.				
Light Breeds	12 =	6.7	5 =	16.7
Heavy Breeds	9 =	10.0	4 =	26.7

Mortality and Sickness.

The percentage of birds which died or were replaced owing to sickness was the same as last year, being 8.5 per cent. for both years. It is of interest that post mortems of the forty-eight birds which died during the 1945-46 competition, carried out by Mr. D. G. Christie, Veterinary Officer, revealed



Three of Mr. N. F. Judson's Group of Australorps.
Winners of the Grand Champion; the Golden Egg, the Judson, the Hadlington Commemoration Medal, the Crescens, the Poultry Newspaper, the Emily Robinson Memorial and other prizes.
The hen in the centre laid the greatest number of eggs in the competition.

One of the White Leghorns entered by Mr. D. A. Cullen.
The group won the Grand Champion Consolation Prize.

that twenty birds died of leucosis, eleven of ruptured oviduct associated with peritonitis, and the remainder from various causes.

The Return over Cost of Feed.

The cost of feeding based on ruling Sydney quotations plus delivery charges, was 8d. per bird higher than last year, the figures being 8s. 3d. this year, compared with 7s. 7d. last year, but the fact that about 25 per cent. of maize was used for the birds in this test as compared with much less last year, and more wheatmeal had to be included, would account for the difference.

White Leghorn of the Group entered by Wimbleford Poultry Farm.
Winners of the Golden Egg Consolation Prize.

The average return for eggs in this Competition was 1s. 6½d. per dozen, or 25s. 0¾d. per bird, and after deducting the cost of feeding—8s. 3d.—a return of 16s. 9¾d. per bird remained, compared with 19s. last year.

This, however, should not be taken as the net return from a commercial flock, as the average farmer had to pay higher rates for small quantities of feed, and was forced, owing to feed shortages, to use large percentages of wheatmeal and ready-mixed mashes, which cost more than pollard and bran; it is estimated that his cost of feeding was at least 8s. 9d. per bird. Again, as the average production on a commercial poultry farm is much lower than in the Competition, where only pullets are tested, the average return for eggs is lower and on the basis of twelve dozen eggs per hen per year, works out at 1s. 5¾d. per dozen, or 17s 9d. per hen, which, after deducting 8s. 9d. for cost of feed, leaves 9s. per bird compared with 10s. on the same basis last year.

Mr. R. Thoroughgood's Hen which won the Prize for Highest Individual Score in the Light Breed Section.

THE normal seasonal fall in egg production has been more marked than usual this year, for two reasons viz., fewer pullets raised and shortage of wheat. If the present trends are maintained, total controlled production for 1945-46 will be in the vicinity of 49 million dozen.

Tubercle-free Herds.

THE following herds have been declared free of tuberculosis in accordance with the requirements of the scheme of certifying herds tubercle-free, and, unless otherwise declared, this certification remains in force until the date shown in respect of each herd :—

Owner and Address.	Number Tested.	Expiry Date.
Registered Stud Herds.		
Bathurst Experiment Farm (Guernseys) ...	28	12/10/46.
Berry Training Farm, Berry (A.I.S.)	129	16/10/46.
H. F. Bradley, "Nardoo," Ashford Road, Inverell (Jerseys)	40	13/4/47.
L. W. Campbell, "Dunmallard," Fern Hill Road, Inverell (Jerseys)	39	21/7/47.
E. J. Cattell, "Kapunda," Rob Roy, Inverell (Jerseys)	121	30/6/47.
E. Chegwidden, "Austral Park," Berry (Jerseys)	88	14/1/47.
Christian Bros., Novitiate, Mt. St. Joseph, Minto	25	11/9/46.
B. N. Coote, Auburn Vale Road, Inverell (Jerseys)	85	23/7/47.
Cowra Experiment Farm (Ayrshires)... ...	53	9/7/46.
Department of Education, Yanco Agricultural High School (Jerseys)	61	1/3/47.
R. C. Dixon Elwatan, Castle Hill (Jerseys)	29	5/3/47.
C. P. Fairbairn, Woomargama	173	17/3/48.
Farm Home for Boys, Mittagong (A.I.S.) ...	31	24/7/46.
Farrer Memorial Agricultural High School, Nemingah (A.I.S.)	44	28/8/47.
N. L. Forster, Abington, Armidale (Aberdeen-Angus)	164	19/5/46.
Forster and Sons, Abington, Armidale (Jerseys)	86	19/5/46.
A. D. Frater, King's Plain Road, Inverell (Guernseys)	107	11/4/47.
W. G. A. & F. J. Frendenstein, "Chippendale," Grenfell Road, Young (Beef Shorthorns)	47	15/1/47.
Grafton Experiment Farm (A.I.S. and Aberdeen-Angus)	249	30/7/46.
Hawkesbury Agricultural College, Richmond (Jerseys)	119	19/3/46.
Hurlstone Agricultural High School, Glenfield (Ayrshires)	52	21/7/46.
Kahlua Pastoral Co., "Kahlua," Coolac (Aberdeen-Angus)	257	30/11/47.
E. L. Killen, "Pine Park," Mumbil (Beef Shorthorns)	261	25/9/46.
G. Knight, Tannabah, Coonabarrabran ...	60	30/11/46.
Lidcombe State Hospital and Home (Friesian)	111	3/10/46.
Limond Bros., Morisset (Ayrshires)	61	26/1/47.
McGarvie Smith Animal Husbandry Farm, Liverpool (Jerseys)	72	22/2/47.
W. W. Martin, "Narooma," Urana Road, Wagga (Jerseys)	160	11/7/46.
Navua Stud Farm, Grose Wold, via Richmond (Jerseys)	120	8/10/47.
New England Experiment Farm, Glen Innes (Jerseys)	40	18/3/47.
G. H. Newnan, "Bunnigalore," Belanglo (Jerseys)	38	2/12/46.
Peel River Land and Mineral Co., Tamworth (Poll Shorthorns)	110	16/10/46.
W. R. Raper, Calool, Culcairn (Beef Shorthorns)	86	12/2/47.
D. B. Reid, "Evandale," Sutton Forest (Aberdeen-Angus)	61	23/11/47.
Riverina Welfare Farm, Yanco (Jerseys) ...	130	26/6/46.
F. S. Simpson "Gunnawarra," Gulargambone (Beef Shorthorns)	167	19/11/47.
Trangie Experiment Farm, Trangie (Aberdeen-Angus)	155	11/3/47.
Wagga Experiment Farm (Jerseys)	15	1/2/47.
H. F. White, Bald Blair, Guyra (Aberdeen-Angus)	300	20/4/47.
Wollongbar Experiment Farm (Guernseys) ...	97	1/3/46.

Owner and Address.	Number Tested.	Expiry Date.
A. Young, "Daylesford," Cudal (Beef Shorthorns)	23	25/2/47.
Herds Other than Registered Stud Herds.		
114 A.G.H., Kenmore...	70	6/6/46.
Aboriginal Station, Brewarrina	14	20/5/46.
Aboriginal Station, Wallaga Lake	19	29/2/46.
Australian Missionary College, Cooranbong...	100	30/8/47.
Barnardo Farm School, Mowbray Park ...	45	25/5/46.
Brookfield Afforestation Camp, Mannus ...	243	3/5/46
N. Cameron, Montrose, Armidale (Late New England Girls School)	33	20/2/47.
A. N. De Fraine, Reservoir Hill, Inverell ...	21	8/6/47.
Department of Education, Gosford Farm Home	37	26/2/47.
Ehsman Bros., Inverell	31	22/8/46.
Emu Plains Prison Farm	115	29/1/47.
Fairbridge Farm School, Molong	25	15/4/46.
F. J. Foy, The Valley Farm, Megalong Valley	25	18/12/47.
W. J. Frizelle, Rosenstein Dairy, Inverell ...	134	16/8/47.
Goulburn District Hospital	5	6/11/46.
A. Hannaford, Braidwood	10	1/2/47.
F. C. Harcombe, Hillcrest Farm, Warialda Road, Inverell	53	10/4/47.
F. W. Hunt, Spencers Gully...	27	16/2/47.
Koyong School, Moss Vale	2	11/4/47.
J. H. Lott, "Bellevue," Rob Roy, Inverell...	41	26/6/47.
Lunacy Department, Callan Park Mental Hospital	43	4/4/47.
Lunacy Department, Gladesville Mental Hospital	20	15/4/46.
Lunacy Department, Morisset Mental Hospital	79	8/3/47.
Lunacy Department, Parramatta Mental Hospital	62	26/7/47.
Lunacy Department, Rydalmere Mental Hospital	57	30/10/46.
J. O. McGufficke, "Lovely Bank," Rob Roy, Inverell	33	25/6/47.
R. G. P. McLane, Ibis Valley, Swanbrook	36	29/5/46.
S. W. Morris, "Dunreath," Swanbrook Rd., Inverell	43	8/6/46.
J. A. Murray, "The Willows," Keiraville...	21	8/8/46.
New England University College, Armidale...	19	1/5/47.
Orange Mental Hospital	63	19/3/47.
Parker Bros., Hampton Court Dairy, Inverell	125	25/8/47.
Peat and Milson Islands Mental Hospital ...	25	6/9/46.
G. T. Reid, "Narrengullen" Yass	167	14/7/46.
C. E. D. Richardson, Kayuga Road, Muswellbrook	101	3/7/45.
V. J. Rolfe, "Mount View," Inverell ...	18	9/2/47.
St. John's College, Armidale	11	20/2/47.
St. Michael's Orphanage, Baulkham Hills ...	26	1/6/46.
St. Patrick's Orphanage, Armidale... ...	10	15/11/46.
St. Vincent's Boys' Home, Westmead ...	37	3/7/46.
State Penitentiary, Long Bay	13	30/11/47.
W. J. Stephenson. "Hill View," Fig Tree ...	53	1/2/47.
The Sydney Church of England Grammar School, Moss Vale	48	18/12/47.
J. M. Turnbull, "Pastime," Kayuga Road, Muswellbrook	85	20/3/47.
A. B. Weidman, No. 2 Dairy, Aberdeen Road, Muswellbrook	68	3/9/46.
A. B. Weidman, No. 3 Dairy, Kayuga Rd., Muswellbrook	38	6/9/46.
A. B. Weidman, No. 4 Dairy, Kayuga Rd., Muswellbrook	57	2/11/46.
T. J. Wilks, "Oaks Farm," Muswellbrook ...	27	27/6/46.
A. G. Wilson, "Blytheswood," Exeter ...	57	6/6/46.
C. Wilton, Bligh Street, Muswellbrook ...	54	12/5/46.
Youth Welfare Association of Australia ...	142	19/3/46.

Tubercle-free Areas.

The following Areas have been declared tubercle-free and no cattle are allowed to be kept therein unless subjected to the tuberculin test and found free from tuberculosis :—

Bombala Area.
Inverell Area.
Braidwood Area.

Municipality of Muswellbrook.
Municipality of Queanbeyan.

MAX HENRY, Chief of Division of Animal Industry.

Brucellosis-free Herd Scheme (Swine).

THE following is a list of the names and addresses of owners of herds which have been declared brucellosis-free in accordance with the requirements of the Brucellosis-free Herd Scheme (Swine). The work in connection with this scheme has been undertaken as part of the general campaign against this disease and should perform a valuable service to the industry generally. Owing to the limitations of staff it will not be possible for the Department to undertake the testing of herds in general for this purpose, and in future only herds belonging to Government institutions, registered stud herds, or those containing a preponderance of registered stud animals, will be accepted for inclusion in the list. A charge will be made for the work, since the inclusion of a herd in this list should be of benefit to the owner. After a herd has been accredited, two semi-annual tests will be required, and thereafter annual tests, provided that the conditions outlined in the agreement form are strictly adhered to and that negative results are obtained at each test. So far as the elimination of the disease is concerned, apart from placing the herd on the accredited list, this work will continue as at present.

Registered Stud Herds.

Bathurst Experiment Farm, Bathurst.
Campbell, D., "Hillangrove," Wamberal, via Gosford.
Cocks, F. D., "Condalarra," Miranda.
Cowra Experiment Farm, Cowra.
Croft, F., Lugwardine, Kentucky.
Draper, R. E., "Glengar," Capertee.
Farrer Memorial Agricultural High School, Nemingha.
Foley, J. B., Gundurimba Road., Loftville, via Lismore.
Garrison Battalion (2nd), Manly.
Gladesville Mental Hospital.
Government Agricultural Training Farm, Scheyville.
Grafton Experiment Farm, Grafton.
Harris, K. H., Pennant Stud Piggery, Purchase Road, West Pennant Hills.
Hawkesbury Agricultural College, Richmond.
Holland, A. L., Argonne, Tubbul.
Hurlstone Agricultural High School, Glenfield.
Maybin, N. C., Towac, Orange.
New England Experiment Farm, Glen Innes.
Newington State Hospital and Home, Newington.
Ricketts, C. C., "Mangus," Young.
Riverina Welfare Farm, Yanco.
Rydalmere Mental Hospital.
Shirley, G. F., "Camelot," Penrith.
Upston, H. E., Wattle Tree Road, Holgate, via Gosford.
Wagga Experimen Farm, Wagga.
Waterfall Sanatorium, Waterfall.
White, A. N Blakeney Stud, Orange.
Williams, G. R. B., "Gwandalan," Grenfell.
Wollongbar Experiment Farm, Wollongbar.
Yanco Agricultural High School.

Herds Other than Registered Stud Herds.

A.G.H. (114 Australia).
Bathurst Gaol, Bathurst.
Brookfield Afforestation Camp, Mannus.
Callan Park Mental Hospital, Callan Park, Rozelle.
Emu Plains Prison Farm.
Glen Innes Prison Camp, Glen Innes.
Gosford Farm Home for Boys, Gosford.
Goulburn Reformatory, Goulburn.
Higgins, J. P., "Koranga," Camden.
Lidcombe State Hospital.
Morisset Mental Hospital, Morisset.
Orange Mental Hospital.
Parramatta Gaol, Parramatta.
Parramatta Mental Hospital.
Peat and Milson Islands Mental Hospital, Hawkesbury River.

Abortion-free Herds.

THE following herds have been declared free of contagious abortion (Bang's disease) in accordance with the requirements of the scheme of certifying herds abortion-free :—

Owner and Address.	Number in herd.
Registered Stud Herds.	
Armstrong, K. A., "Heathfield," Boorowa	23
Bathurst Experiment Farm (Guernseys)	28
Cowra Experiment Farm (Ayrshires)	71
Department of Education—Farm Home for Boys, Mittagong (A.I.S.)...	52
Dixson, R. C., "Elwatan," Castle Hill (Jerseys)... ...	29
Fairbairn & Co., C. P., Woomargama (Beef Shorthorns)	98
Farrer Memorial Agricultural High School, Nemingha (A.I.S.)	44
Forster and Sons, Abington, Armidale (Jerseys) ...	59
Forster, N. L., Abington, Armidale (Aberdeen-Angus) ...	179
Hann, O., Chatsworth Road, St. Marys (Jerseys) ...	14
Hann, O., "Bomerah," Barrington (Jerseys)	42
Hawkesbury Agricultural College, Richmond (Jerseys)...	96
Hill, E. Pritchard, Bowling Alley Pt. (Jerseys)	96
Hurlstone Agricultural High School, Glenfield (Ayrshires)	53
Killen, E. L., Pine Park, Mumbil...	141
McEachern, H., Tarcutta (Red Poll)	61
McSweeney, W. J., "The Rivers," Canowindra (Beef Shorthorns)	76
Martin Bros. "Narooma," Urana-road, Wagga (Jerseys)	160
Navua Stud Farm Grose Wold, via Richmond (Jerseys)	120
New England Experiment Farm, Glen Innes (Jerseys) ...	46
Peel River Land & Mineral Co., Tamworth (Poll Shorthorns)	86
Raper, F. S., Calool, Culcairn	80
Riverina Welfare Farm, Yanco	135
Simpson, F. S., "Gunnawarra," Gulargambone (Beef Shorthorns)	150
Training Farm, Berry	118
Trangie Experiment Farm, Trangie (Aberdeen-Angus)	155
Wagga Experiment Farm, Wagga (Jerseys)	25
Walker, Jas. R., "Strathdoon," Wolseley Park (Red Polls)	42
White, F. J., and Sons, Bald Blair, Guyra (Aberdeen-Angus)	263
Whitelaw, L. A., "Wendouree," Merriwa (Beef Shorthorns)	79
Wollongbar Experiment Farm (Guernseys) ...	110
Young, A., "Daylesford," Cudal (Polled Beef Shorthorns)	27
Herds Other than Registered Stud Herds.	
A.G.H. (114th Australia)	66
Callan Park Mental Hospital	44
Department of Education—Farm Home for Boys, Gosford	37
Fairbridge Farm School, Molong	89
Morisset Mental Hospital	79
New England University College, Armidale	19
Orange Mental Hospital	63
Parramatta Mental Hospital	30
Peat & Milson Islands Mental Hospital	25
Royal Prince Alfred Hospital, Camperdown "Yaralla" Herd	94
Rydalmere Mental Hospital, Rydalmere	57
Salway, A. E., Cobargo	87

MAX HENRY, Chief of Division of Animal Industry.

JUNE, 1946.

EDITORIAL—

Selling Our Wool Clip.

FOR the first time in seven years Australia's wool clip will be sold by auction when the sales commence next spring. Acquisition by the British Government under the appraisement system, which served the industry so well during wartime, will terminate.

While admitting the benefit and wisdom of the acquisition scheme, few woolgrowers make any attempt to hide their enthusiasm for a return to auctioning the clip. Confidently they predict a substantial increase in prices. In part, the prediction may prove correct, in that keen demand for combing wools of good quality will almost certainly result in an improvement on appraisement price levels for those types. But what of other types? They, and "piece" lots, have a big bearing on the total return for the clip, and the individual is more vitally interested in his total wool cheque than in what he gets for a few bales of top-grade wool. And the words "few bales" need emphasising, because Australia's total clip is made up very largely of wool from small flocks. Clips from small flocks generally show greater variation than those from large flocks, which allow of greater scope for specialised breeding and husbandry programmes.

Warning sheepmen that whatever benefits may result from a return to auction sales would not be wholly automatic, the Department's Sheep and Wool Expert recently mentioned two points which will bear repeating. The first was that there is, in Australia, a large carry-over of second-grade wools (comprising largely, short fibred, burry, seedy wools which are relatively expensive to manufacture) from the acquisition scheme. Approximately 4½ million bales was the quantity mentioned.

Secondly, buyers would be tempted more readily if the classes of wool they were seeking were available in large parcels. This suggests that growers would be wise to class their clips in fewer lines than were perhaps necessary under the appraisement scheme, which provided for well over one thousand types. It was still advisable, however, that each class should be even in length, quality and condition, and that fleece lines be free of unsound wools, but it was now unnecessary to differentiate between

lines merely because of slight variations in colour.

Joint Organisation (or, simply, J.O.), which represents British and Dominion interests, has been set up mainly to dispose of the carry-over stocks of low-grade wool from the acquisition scheme. J.O. has authority to purchase as well as to sell, so that it might function as an equalising instrument. It hopes to clear the carry-over wools in the next fourteen years by feeding into the auctions a portion each year. This will need the keenest of judgment to prevent depression of prices in those particular classes. One unknown factor which can upset that judgment is the amount of inferior types which growers will offer each season.

Competition is the main merit of the auction system of selling. The system is robbed of that merit in relation to any type of wool if more of that type is submitted than is required to meet the demand. Even admitting the abnormal circumstances during the war, the fact that, with woollen mills in allied countries working at full pressure, there still remains a surplus of 4½ million bales of lower grade types, seems to indicate that woolgrowers should exert every effort to reduce the proportion of inferior types.

Apart from careless breeding there are other price-reducing factors which are too commonly neglected by sheepmen. Burry and seedy wools are unavoidable in many parts of the State, but the dust nuisance can be reduced by avoiding unnecessary handling of sheep in dusty yards. Far too much wool is damaged by the careless use of blowfly specifics which discolour the fleece. Brand marks which cannot be removed by scouring are still the bugbear of manufacturers. When brands remain plainly visible at shearing time, it would often pay to remove them with hand shears prior to the general shearing.

These may appear to be small items in an industry worth £60-million to Australia each year, but that huge total is made up largely of returns from so many small clips that even small losses, if experienced in most clips, can amount in total to an enormous drain on the industry.

Farm Record Books Available.

FARMERS may now procure farm record books from the Department of Agriculture for the nominal sum of two shillings and sixpence (2s. 6s.).

These books contain simplified and well-tested records for entering all receipts and expenses and for making an inventory of farm assets. They contain also records for noting crop acreages and production, quantities of feed used, changes in livestock numbers and the allocation of labour-time between different farm enterprises. During the past three years these record books have been tested out by several hundred farmers and found practicable for farm conditions.

The record books show how to analyse and interpret the records at the end of the year. They are designed for the twelve months commencing 1st July, 1946.

There are three types of record books, suitable for the following farming types:—

(1) Wheat, mixed wheat-sheep and grazing.
(2) Dairying.
(3) Horticulture (fruit or vegetables) and poultry.

The horticultural book contains several special records for orchardists.

When making application the type of farming carried out should be stated. Applications, accompanied by a postal note for two and sixpence (2s. 6d.) should be forwarded to:—The Chief, Division of Information and Extension Services, Department of Agriculture, Box 36A, G.P.O., Sydney.

Cattle Tick at Alice Springs.

IN a statement concerning the precautions necessitated by the recent discovery of cattle tick at Alice Springs, the Minister for Agriculture, Mr. Graham, announced that certain restrictions on the movement of cattle and horses from South Australia by rail have now been introduced. Persons contemplating the movement of cattle and horses (except those stabled and groomed) from South Australia to New South Wales are advised first to make contact with the Department of Agriculture in South Australia or in this State, or with the Inspector of Stock at Broken Hill.

Some Essentials to—

STABILITY IN POST-WAR POTATO PRODUCTION.

Value of Sound Cultural Practices.*

A. C. ORMAN, H.D.A., Special Agricultural Instructor.

WITH the end of the war, and the nation's potato requirements restored to something approximating the pre-war level, the necessity for all round efficiency in production becomes a matter of the greatest economic importance to individual growers. Apart from the price factor they must look for another means by which returns may be stabilised, and it is to be found in adopting sound practices aimed at regularly securing the highest yields for an economic outlay.

Because of the importance of potatoes in the diet, it was necessary to stimulate potato production during the war in order to meet increased service and civilian requirements, and had it not been for the payment by the Commonwealth Government of a guaranteed price, and the whole-hearted and spirited response on the part of the growers, the necessary production could not have been achieved. Despite the many disabilities with which the growers had to contend, such as shortage of manpower and essential materials, the acreage planted in New South Wales during the last two years of war was almost double the pre-war figure, and for the Commonwealth the increase was over 100 per cent—a truly remarkable effort by all concerned.

Most experienced potato growers in New South Wales, and indeed in Australia, will readily agree that during the war the industry enjoyed a measure of stability never previously experienced. Growers received a payable, guaranteed price for potatoes of a specified quality, and distribution was planned and organised in accordance with requirements.

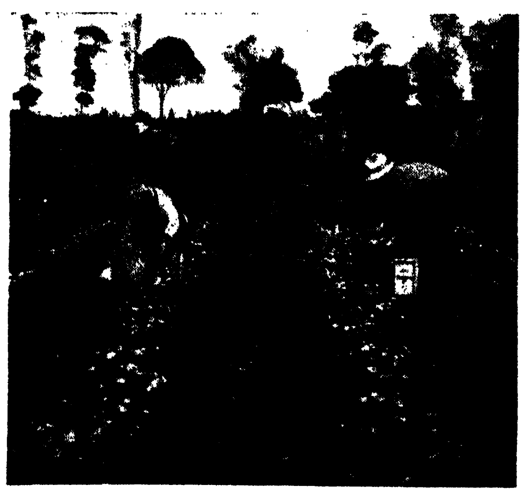
There are many aspects of potato growing which influence the economic production of the crop, and it is the purpose here to deal briefly with several of the more important of these.

Crop Rotation.

Crop rotation is of vital importance to the potato grower from the standpoint of yield, quality and disease control. There is a tendency for some farmers in this State to specialise in potato production and to exclude other crops and livestock from their holdings. This is unwise. Potato growing is essentially a mixed farming proposition, and not more than about one fifth of the total cultivable area on the farm should be devoted to potatoes in one year.

The majority of potato land in New South Wales is sadly lacking in organic matter or humus. This deficiency can only be restored by the adoption of a correct rotation in which a leguminous crop is sown and subsequently ploughed under prior to planting potatoes. Potatoes are very exhaustive of the soil's plant food, and continuous cropping on the same land becomes uneconomic, despite the grower's efforts in other directions.

Red and Subterranean clover sown as a pasture are recommended to tableland



Picking-up a Heavy Crop.

* Notes of a recent broadcast over National Stations.

A Good Crop of Factors.

growers, and a clover pasture and annual legumes, and when procurable, farmyard manure, are recommended to coastal growers. Many growers could double their yields by adopting this practice in conjunction with planting good quality seed. Crop rotation will, I believe, be a major factor in controlling soil borne diseases such as fusarium wilt, scab, rhizoctonia and black-leg, and insect pests, especially the potato moth, in our main producing districts. A rotation of, say, oats for hay, red clover (three years), potatoes followed by peas, should be suitable for most tableland districts.

Selection of Seed.

The ultimate yield of potatoes is greatly influenced by the quality of the seed planted. Virus diseases such as leaf roll, which are seed borne and also transmitted in the field by aphids, may be responsible for reducing yields by as much as 30 or even 40 per cent. in some cases. Consider a loss of 2 or even 1½ tons per acre in a potential 6 ton crop, as the result of using poor quality seed. At £14 per ton, the present contract price, the financial loss is evident, and certainly worthy of consideration by the grower.

It must be remembered that good seed cannot be judged by its appearance. On the contrary, the best looking seed, that is the smooth, round, shallow-eyed tubers, is invariably the progeny of virus-infected plants. There is only one way of being certain of the quality of potato seed, and that is by knowing the history of the crop which produced that seed. The use of certified seed, which is produced from crops of a high standard as regards freedom from disease and impurities, and vigour, as determined by inspections carried out by the Department of Agriculture, and therefore having a history, is the answer to the seed problem.

Coastal growers should secure certified seed for greater yields. All tableland growers, on whom the task of improving the seed rests, for they supply the whole of the State's requirements, should plant a stud plot each year to provide seed for the following season. All that it is necessary to do is to secure certified seed, plant it on clean land apart from the commercial area, and remove undesirable plants as they appear. It should be realised that all seed will degenerate or "run out," unless the seed crop is properly rogued.

Treatment of Seed.

The importance of properly preparing seed for planting needs to be stressed. First of all, secure the seed as early as possible; this particularly applies to coastal growers.

Then dip it, while dormant, for the control of scab and rhizoctonia diseases, which are both soil and tuber borne, using the acidulated corrosive sublimate dip or organic mercury preparations, according to directions.

The seed should then be green sprouted, not in bags, but by spreading out the tubers in thin layers in subdued light or placing

Careful Grading Creates Confidence among Buyers.

them in shallow boxes. A barn or hay shed free from mice and rats is very suitable for the purpose. Greening promotes the development of thick, sturdy shoots, facilitates cutting, hastens emergence, increases germination and as a result the final yield.

There is a considerable difference of opinion amongst growers regarding the practice of cutting the seed. For the early crop, which is usually planted under favourable soil conditions, cut seed may be safely used, providing the sets are not too small or planted too deeply. With the tableland growers the position is somewhat different. Planting is done during the summer when conditions are conducive to seed decomposition, and the use of cut seed is risky.

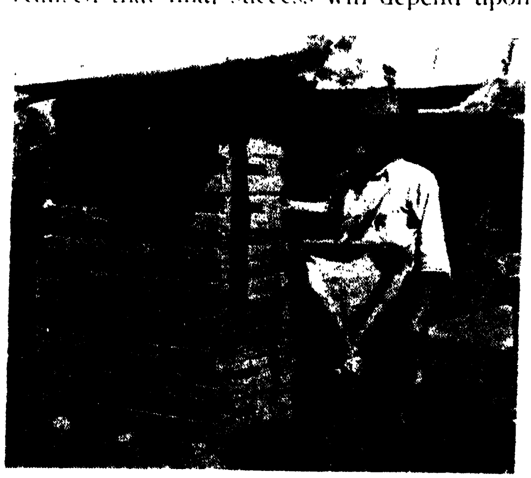
When it is necessary to cut seed, each piece should be approximately 1½ oz. in weight and contain two live eyes. The seed should be planted immediately after cutting. It is not necessary to treat the cut surface with ashes or lime.

Control of Potato Moth.

The potato moth may be regarded as enemy number one of the potato grower. Every year, without exception, this pest causes losses amounting to thousands of pounds. Because of its habits and incidence, its control is a difficult matter. However, the grower can do much to reduce losses. Deep planting within limits, efficient hilling (and for this wide rows are necessary), crop rotation, clean cultivation to control self-sown plants, and installation of irrigation where possible, will all contribute to reducing losses.

Other Important Factors.

Other important points in stabilising returns include early and thorough preparation of land, choice of suitable varieties, judicious cultivation and irrigation by those growers who are fortunate to have the facilities, and good grading. It must be realised that final success will depend upon



Greening Seed Potatoes on the Tablelands.

proper attention being given to all phases of production, and not to a few only.

CONDITIONS over the past few months have been mostly favourable for potatoes. During March the weather was cool with heavy frosts; also good rains fell and these have improved yields and reduced the danger of damage from moth.

Generally speaking, prospects in all districts are good, despite the presence of moth in some areas, and marketable yields are expected to be well above average.

PROGRESSIVE FARMER COMPETITION.

Winner's Tour Commences

PROPOSED ITINERARY.

THE winner of the Progressive Farmer Competition (Mr. A. K. Gardiner, of King's Plains, via Blayney), sailed for the United States of America on the s.s. Marine Lynx on 15th May. This competition was organised by the Agricultural Bureau of New South Wales in co-operation with the Rural Bank of New South Wales and Broadcasting Station 2GZ. Its purpose is to send a typical progressive New South Wales farmer to the United States of America for a period of six months to study agricultural production and marketing methods and to establish cultural relationships with the United States farmers engaged in similar types of agriculture to those carried out in this State.

Mr. A. K. Gardiner of King's Plains, Via Blayney.
Winner of the Progressive Farmer Competition, who sailed for U.S.A. on 15th May.

Chosen from among district finalists by a panel of judges, Mr. Gardiner showed special ability, not only as a practical farmer, but because of his capacity for self-expression, his public spiritedness and his potential leadership qualities.

The United States Information Service has made available the suggested itinerary for Mr. Gardiner. It is proposed that he should first see the sheep, vegetable and fruit areas of California at Davis and Los Angeles, being guided by officers of the University of California, and then travel to Salt Lake City by way of Las Vegas, Nevada, where he will see the famous Boulder Dam. In Utah he will be shown the sheep and cattle areas, meet some of the producers and see the co-operative set-ups operating in this area.

Similar arrangements have been made for his stay in Colorado where he will see the Denver stockyards and, in addition, wheat and vegetable production and marketing methods and agricultural extension work.

Mr. Gardiner will then proceed to Washington to meet the Secretary for Agriculture and visit the offices of the United States Department of Agriculture. He will probably spend a few days in New Jersey and Maryland, a week in Tennessee to see the work of T.V.A., and then proceed to Chicago to see the extensive marketing and collective buying systems of the Illinois Farm Bureau and also the Grain Exchange in action.

It is then planned that Mr. Gardiner should stay a week in Wisconsin, and about six weeks in the State of Iowa where he will visit the State Fair and the Iowa State College to see the work being carried out with pigs, hybrid corn, soybeans, soil conservation, 4H clubs, returned soldier developments and consolidated rural schools.

About 1st October he will start to trek back west. It is proposed that he should stay at Yankton, South Dakota, and spend a day with W.N.A.X. radio people, and that his route to Vancouver, Canada, should pass through Montana, Yellowstone, into the Wanachee Valley, where he will be shown apple harvesting, packing and marketing.

THE GROWING OF OATS ON WHEAT FARMS

Enables Greater Diversification and Conserves Fertility.

CONTRIBUTED BY THE DIVISION OF PLANT INDUSTRY.

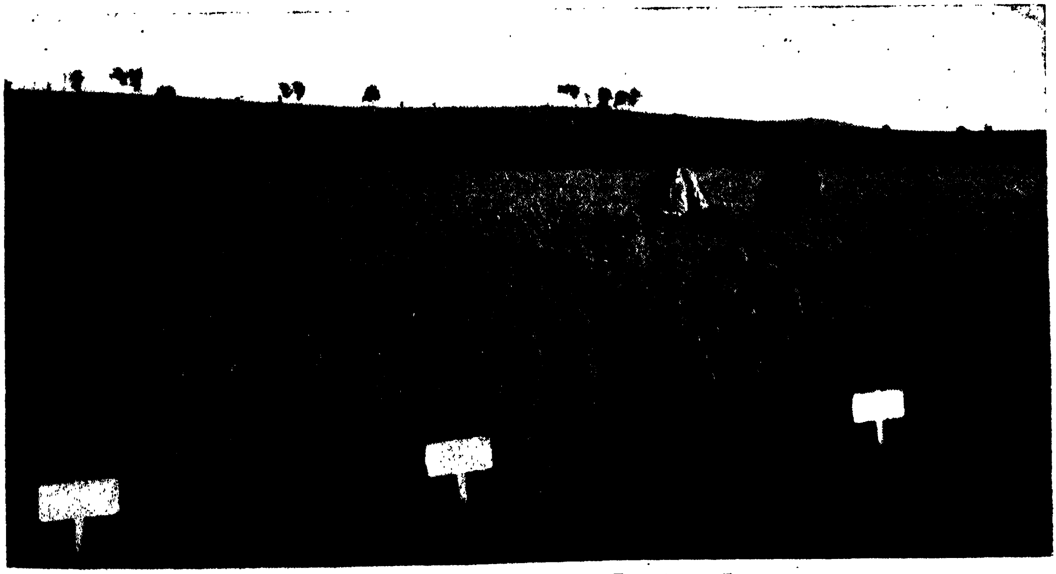
UNTIL 1920 the oat-growing industry in New South Wales was of comparatively minor importance, and was confined to the colder districts, such as the tablelands and the cool parts of the western slopes—largely because only late maturing varieties were then available. Since 1914, however, a fourfold increase in the acreage sown to oats has occurred. This development has not been paralleled by any other crop, and at the present time, in contrast with thirty years ago, there is no part of the wheat belt in New South Wales, including the driest regions, where oats cannot be grown successfully, yielding as well as wheat for grain and hay. There is still room, however, for a very considerable expansion in the acreage sown to oats, because of the special advantages of this crop to the wheat grower who produces sheep in addition to his cereal crops.

The secure position in which the industry stands to-day, and the opportunities for further expansion are largely due to the work of one man, Mr. J. T. Pridham, who was a plant breeder in the New South Wales Department of Agriculture for many years. The new and improved early maturing varieties of oats which he bred placed the industry on a sure footing and made possible the expansion in area which has occurred within the under 20 inch rainfall districts. His first early maturing oat variety Sunrise, was produced in 1914, followed a few years later by Mulga, Belar, Buddah and Gidgee, which provided opportunities for using oats in the less favoured portions of the wheat belt.

The Case for Oats on the Wheat Farm.

There is still a need for a much greater diversification of production on New South Wales wheat farms. Greater emphasis is now being placed on stockraising, and departure from one-crop farming methods.

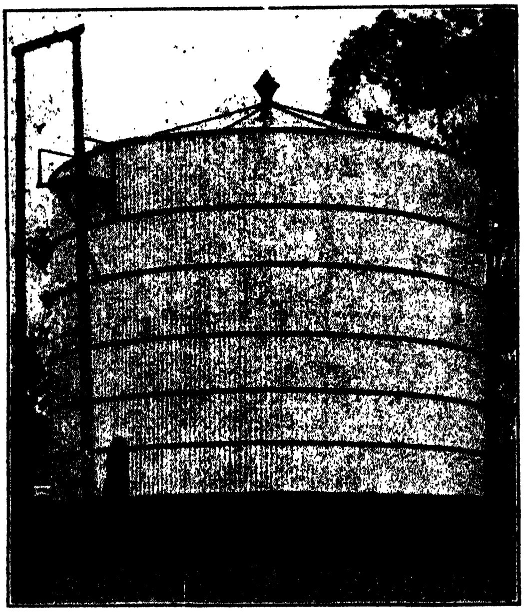
Oats fit in well on the wheat farm and help to solve, although in part only, the by no means easy problem of providing alternative crops for wheat. Many advantages are claimed for the oat in fulfilling this function, but it must be borne in mind that



Plant Breeder's Oat Plots at Cowra Experiment Farm.

oats are a cereal crop and very closely related to wheat in many respects. It may be safely said, however, that oats are more adaptable than is wheat under general farming conditions and will do better on colder, wetter, heavier or very fertile soils than wheat.

Oats are not susceptible to wheat rusts, and their resistance to foot-rot is claimed to be an advantage where this disease is troublesome. Oats are also not susceptible to "take all." Where a year of fallow follows an oat crop, the spores of these diseases are given further opportunity to germinate in the absence of a host, affording a measure of control. It will be seen that this is one of the advantages deriving from a rotation containing wheat-oats-fallow.



Galvanised Iron Grain Silo.

The average yield of wheat in New South Wales is about 13 bushels or 780 lb. per acre, while for oats the average is in the vicinity of 17 bushels or 760 lb. This high yield is achieved despite the fact that, in general, oat crops are far more heavily grazed than are wheat crops, and frequently less care and attention is paid to their cultivation than is the case when wheat is sown. Feeding off a cereal crop frequently brings about a reduced grain yield, but oats usually recover better than wheat after grazing.

Oats do better than wheat or barley after a rougher preparation of the soil, or where fertiliser is restricted, and oat grain is less liable to "malting" in the ground, permitting earlier sowing in the absence of sufficient moisture for germination. Again oats are slightly less susceptible to seedling blights than the other small-grain cereals.

Oats Fit into the Cultivation Schedule.

At harvest time, the grower of an oat crop is enabled to spread his harvesting operations over a longer period. Oats for silage is the first crop harvested—the oaten hay crop clashes, to a more or less extent with the early wheaten hay harvest, as oats for hay are harvested at a relatively more advanced stage of maturity than is wheat. Early maturing oat varieties have been evolved for grain production; these would clash only with the earliest wheats such as the Pusas.

A weakness of the oat crop is that it shells more readily than wheat, and is more prone to lodging on fertile soils.

Oats Fed to Sheep Help Maintain Soil Fertility.

There can be no doubt that an increase in the number of stock maintained on the average wheat farm is necessary, but to support the increased number economically and in good condition it is necessary to grow fodder crops and to lay down reserves of fodder. It is here that there is room for a greater use of oats.

The oat grain does not lend itself to export from the farm to any great extent, and there is no overseas market. However the crop is admirably suited for feeding to stock on the farm and thus to be marketed "on the hoof." By this means a sizable proportion of the fertiliser elements in the crop is returned to the soil in the droppings of the stock.

In addition, the keeping of stock assists greatly in the maintenance of soil fertility, through the beneficial effects from the growing of pastures, especially those containing legumes, and the greater variety of crops grown. A more complete utilisation of stubbles is made possible and valuable humus building material is returned to the soil.

The ultimate effect of this diversification, as compared with one crop (wheat) farming, is the saving of soil fertility. This greatly assists in the control of the twin evils of weeds and soil erosion.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Grazing Uses of the Oat Crop.

Grazing oats are cheaply and most economically grown on wheat stubble land following the first break of autumn rains. Five to six weeks later some grazing feed is available and five or ten sheep to the acre may be carried for a period of ten to fourteen days.

Oats will "come away" much earlier than natural pasture, and it is the early green feed which is valuable to pregnant ewes and early lambs. The indirect value of this early grazing from oats in saving the natural pasture until such time as it has made body, and the provision thus made for a change of feeding area and diet are important considerations. Oat crops may be grazed right into late spring, succulent feed being thus available for stock, especially for topping off lambs at a time when grass seed is generally a nuisance in the pastures.

development which cuts storage losses considerably and which enables a surplus to be marketed advantageously during drought periods.

Placed in galvanised iron silos of a capacity of 1,000 bushels or so, oat grain may safely be stored for years, and is conveniently available for use whenever required. As a feed for stock, oats are preferred partly because of the greater ease of storing and handling due to their physical condition. They are also less liable to weevil attack. Wheat cannot be stored for long periods unless it is regularly turned over and aerated.

Oats may thus be used to provide for the feeding of stock over a prolonged period, and in this way enable more stock to be safely and economically carried on the wheat farm.

Sheep Feeding from Self-feeders.

Oat straw is softer than wheat straw, making the stubbles more valuable.

Oats Excel as Conserved Fodder.

Oats excel as conserved fodder, either as silage, hay or grain. Cutting oats for silage may commence a week or so earlier than for hay, and when the material is in the pit, it is in safe storage for many years until it is required.

The oat hay cutting stage directly follows that of silage making and the aim should be to cut crops of good quality and to protect the hay effectively against deterioration. Unprotected hay may be a liability instead of an asset, the loss from weather, vermin and stock easily reaching a figure of 25 per cent. or more. Baled oaten hay is a modern

Quality Counts.

Fodder reserves are usually looked upon as material available for the feeding of stock during periods of drought only, but if increased attention is to be given to the production of fat lambs, mutton, wool, pork, beef or other stock products on the wheat farm, fodder reserves must play an important part in the supplementary feeding of stock during each year.

Chance crops or surplus growth produced during flush seasons often consist of overgrown, mushy material of poor quality. Reliance upon such sources of material to provide regular and adequate supplies of conserved fodder is too much of a gamble to be considered good farming.

(Continued on page 297).

Growers of Approved Seed Oats.

THE following growers have supplies of approved seed oats for sale. The crops of these growers were inspected by Officers of the Department and reached a standard of purity and trueness to type up to the approved standard.

Growers listed should notify the Department immediately their available seed of any variety is exhausted.

Algerian.—
Wilson, R. & Sons, "Fairview," Oberon.
Dickson, A. S., "Yurunga," Oberon.
Witten, R. A., "Willowbank," Oberon.
Howard, G., "Kallara," Springdale.
Burns, W., Goongirwarrie, Carcoar.

Belar.—
Hall Bros., 'Ellerslie," Wallendbeen.
Hill, A. H., "Carawatha," New Molyan, via Mendooran.

Belar—continued.
Witten, R. A., "Willowbank," Oberon.
Uther, L. F., "Myonah," Cowra.
Ward, H. E., "Gwenvale," Parkes.
Cullen Bros., Bunglegumbie, via Dubbo.
Idiens, E., "Kangarooby," Gooloogong.

Brigalow.—
Wilson, R. & Sons, "Fairview," Oberon.
Gardiner, A. K., Claremont, King's Plain, Blayney.

Fulghum.—
Crick, P., "Mayfair," Gollan.

Kurrajong.—
Ward, H. E., "Gwenvale," Parkes.

Approved Seed—June, 1946.

To assist in the production and distribution of approved seed of recommended varieties of crops and vegetables, the Department publishes in this list each month the names and addresses of growers of such seed.

Cauliflower—
Shorts—H. Burton Bradley, Sherwood Farm, Moorland.

Varieties of Approved Seed Available.

IN order that farmers may be directed to what are regarded by the Department as the most satisfactory local sources of approved seed of recommended commercial varieties of farm crops and vegetables, the Department is willing to supply information concerning such sources of seed of the following varieties:—

Tomatoes—
Rouge de Marmande, Pearson, Break O'-Day, Tatura Dwarf Globe, Moscow.

Germination Tests of Stored Tomato Seed.

RECENT germination tests of Bonny Best tomato seed which has been stored for three years, have given interesting results.

The seed, harvested in 1943 at Bathurst Experiment Farm, originally germinated 93 per cent. During the first two years of storage the seed showed no deterioration at all. The storage conditions are:—

1. In "natural" temperatures—
   (*a*) in unsealed containers, and
   (*b*) in sealed containers.
2. In cold store (approximately 40 deg. Fahr.)—
   (*a*) in unsealed containers, and
   (*b*) in sealed containers.

The 1946 germination results (average of tests made in quadruplicate) are as follows:—

	Germination Percentage. 4 days	10 days
1. "Natural" temperatures—unsealed	60	84
" " —sealed	73	94
2. Cold storage ... ... —unsealed	93	95
" " ... ... —sealed	91	94

Deterioration since the 1945 tests has occurred only in those lots stored in "natural" temperatures. Germination of the seed in open storage has dropped by about 10 per cent. and the germinating energy of both the unsealed and sealed lots has decreased—to a greater extent in the former than the latter. These storage tests are to be continued over a period of years.—AMY MYERS, Seed Analyst.

The Problem of—

DECLINING FERTILITY IN RED LATERITE SOILS.

IMPORTANCE OF REGULAR MINERAL INCOME

Experiments on the Effect of Added Phosphate and Liming Materials.

N. H. PARBERY, D.Sc.Agr., Analyst.

ARREST of the decline in fertility in the half-million acres of red and brown degraded basaltic soils, or laterites, which occur in the high rainfall zones of coastal New South Wales, or more positively, an uplift in their productive capacity, would represent economic betterment both for the producers on these soils and the community at large.

The chemical anatomy of the soil has been laid open, and many defects arising from the insidious wastage through natural, and to a lesser extent by human, exploitative agencies, call for correction. It can be confidently stated, however, that while public attention is momentarily focussed on one or another ounce-per-acre panacea and conjures unwarranted hopes of an easy way out, the solution of fertility maintenance in these soils is no more spectacular than the trite but costly recipe of putting back some of the massive amount of nutrient material which has been leached or exported from the soil. No form of long-term utilisation of deteriorated soils can profitably persist without a regular mineral income.

The experimental data presented in the present series provide a basis for formulating field experiments. Subsequent articles will deal with other phases of this problem.

The soil used in the experiment was taken from Wollongbar Experiment Farm, Alstonville, which lies within the extensive area of red laterite known as the Big Scrub. While moderate variations in the degree of disruption of the soils occur, the Wollongbar soil conforms to the general characteristics of the soils of the area. The surface ten inch horizon of the brownish-red, clay laterite was collected, the profile comprising: well-granulated brownish-red clay laterite, 0-10 inches; reddish clay, 10-15 inches; heavy reddish clay, 15-48 inches. The soil was very acid (pH 4.85), poor in exchangeable nutrient cations (calcium 2.6, magnesium 1.2, potash 0.75, sodium 0.91, hydrogen 22.6 Ways), highly unsaturated (81 per cent.) contained much native phosphate (0.64 per cent. P_2O_5) of very low citric and Neubauer availability, aluminium (20 per cent. Al_2O_3), iron (34 per cent. Fe_2O_3), low SiO_2/R_2O_3 ratio (0.65) in the clay fraction (58 per cent. and moderate organic matter content for the soil type (8.8 per cent.). Field moisture capacity was 40 per cent., and wilting point 21 per cent. of water.

Treatments.

Since the behaviour of phosphate in the soil was primarily under review, the possibility of other limiting factors was removed by the basal application of 2 cwt. sulphate of ammonia and 3 cwt. of a mixture of sulphate and chloride of potash per acre 8 inches, mixed throughout the soil. The addition of nitrogen eventually proved a repressive influence in certain treatments, for nitrification was found to be effective even under the very acid conditions. In the soils treated with dolomite prior to planting, nitrate nitrogen accumulated to the extent of 90 parts per million of soil. Minor elements, where used, consisted of zinc, copper, manganese, borax and molybdenum, mixed throughout the soil.

Dolomite, applied two months prior to planting, cement, basalt and sodium silicate were mixed throughout the soil. Phosphate, except in Treatment 6, was distributed in a plane at a depth of 3 inches. This depth was selected arbitrarily, but later experiments demonstrated the unimportance of placement of phosphate where the water régime was optimum.

Italian rye grass was used as the nutrient absorbing agent, and was sown in 3.4 gallon glazed pots containing 30 lb. of soil. The pots were placed out of doors in full sunlight and water was added regularly to restore the soil to field moisture capacity. The first cut of grass was made 80 days after sowing and a second cut 151 days later. The treatments were as follow:—

TREATMENTS.

(1) Control.
(2) Control + minor elements.
(3) 4 cwt superphosphate + minor elements.
(4) 4 cwt. superphosphate.
(5) 8 cwt. superphosphate.
(6) 8 cwt. superphosphate mixed through the soil.
(7) 4 cwt. superphosphate in pellets (¼ inch).
(8) 8 cwt. superphosphate in pellets.
(9) 6 cwt. serpentine superphosphate.
(10) 12 cwt. serpentine superphosphate.
(11) 6 cwt. serpentine superphosphate + minor elements.
(12) 2 tons cement.
(13) 2 tons cement + 4 cwt. superphosphate.
(14) 3 tons dolomite.
(15) 3 tons dolomite + 4 cwt. superphosphate.

(16) 3 tons dolomite + 4 cwt. superphosphate + minor elements.

(17) 4 tons ground basalt.

(18) 4 tons ground basalt + 4 cwt. superphosphate.

(19) 1 ton sodium silicate + 4 cwt. superphosphate.

Serpentine superphosphate is a New Zealand product consisting of a mixture of three parts superphosphate and one part of ground serpentine. A reaction takes place between the materials and most of the phosphate is rendered insoluble in water. The sample used in the experiment contained 14 per cent. P_2O_5, including 2 per cent. water-soluble P_2O_5. To equalise the phosphate additions, one and a half times as much serpentine superphosphate as superphosphate was added in comparable treatments. The superphosphate, except that in pellet form, was the normal granular commercial form containing 22 per cent. P_2O_5.

Table 1 gives details of the first cut of grass—yield of dried material, phosphate content, phosphate added, phosphate absorbed and net phosphate absorbed, allowing for absorption from the untreated soil.

TABLE 1.—FIRST CUT—80 DAYS AFTER SOWING

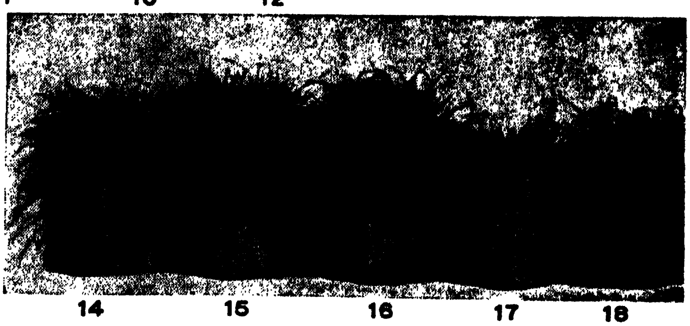
Treatment.	Yield Dry Grass.	Percentage P_2O_5 in Grass.	P_2O_5 Added.	P_2O_5 Absorbed.	Net P_2O_5 Absorbed.
	gm.		mgm.	mgm.	mgm.
1. Control	5·72	0·531	0	30·4	...
2. Control, M ...	4·96	·506	0	25·1	...
3. 4S, M	25·275	·576	662	145·6	115·2
4. 4S	23·595	·627	662	148·0	117·6
5. 8S	30·735	·678	1,324	208·3	177·9
6. 8S mixed ...	13·003	·576	1,324	74·9	44·5
7. 4S pellet ...	13·380	·697	662	93·3	62·9
8. 8S pellet ...	22·430	·729	1,324	163·6	133·2
9. 6SS	23·603	·605	662	142·8	112·4
10. 12SS	32·321	·653	1,324	211·0	180·6
11. 6SS, M	25·350	·573	662	145·3	114·9
12. 2 tons C	17·541	·653	43	114·5	84·1
13. 2 tons C, 4S ...	19·147	·742	662	142·2	111·8
14. 3 tons D ...	13·417	·608	0	81·6	51·2
15. 3 tons D, 4S ...	37·998	·640	662	243·2	212·8
16. 3 tons D, 4S, M...	38·398	·665	662	255·5	225·1
17. 4 tons B ...	7·865	·588	359	46·3	15·9
18. 4 tons B, 4S ...	17·590	·614	1,021	108·0	77·6
19. 1 ton Sil., 4S ...	23·280	·678	662	157·9	127·5

Italian Rye Grass at First Cut.

1.—Control.
3.—4S, M.
4.—4S.
7.—4S, pellet.
8.—8S, pellet.
5.—8S.

2.—Control, M.
9.—6SS.
11.—6SS, M.
10.—12SS.
12.—2 tons cement.

14.—3 tons D.
15.—3 tons D, 4S.
16.—3 tons D, 4S, M.
17.—4 tons basalt.
18.—4 tons B, 4S.



Yields of dried grass at the first cut indicated that minor elements alone are of no advantage. The addition of 4 cwt. of superphosphate (Treat-

ment 4) promoted a large increase in growth, but the addition of minor elements with superphosphate (T3) was again of no practical advantage. A moderate increase over the 4 cwt. of superphosphate treatment resulted from the use of 8 cwt. superphosphate (T5), but the importance of a localised distribution was shown in the poor yield resulting from the distribution of 8 cwt. superphosphate (T6) throughout the soil. The use of superphosphate in ¼-inch pellets proved a very unsatisfactory form of application. In pellet form, 4 cwt. of superphosphate gave results similar to 8 cwt. superphosphate distributed throughout the soil, and 8 cwt. in pellet form was inferior to 4 cwt. of the ordinary granular form. Despite its low content of water-soluble phosphate, serpentine superphosphate when used at one and a half times the rate of superphosphate to equalise phosphate application, gave results (T9, 10) almost identical with those obtained from superphosphate. The addition of minor elements to serpentine superphosphate (T11) was, as previously found, of no advantage.

Liming materials in the form of cement and dolomite promoted large increases in yield, but growth was undoubtedly hindered by the absorption of toxic amounts of nitrate arising from the acceleration of nitrification by these treatments. The growth on these pots was erect, narrow and grey-green, and in the cement treatment was later found to contain 1.6 per cent. nitrate nitrogen, a concentration which has been found in other experiments with rye grass to hinder growth. The reaction of the very acid soil treated with cement and dolomite was raised less than 0.8 of a pH unit, so that hydrolysis of the native phosphate is not considered to have promoted the increase in growth, but rather that growth was stimulated by the removal of a calcium deficiency which affected root development and efficiency. The effect of dolomite was found to persist, and at the conclusion of a third cropping period yields from the dolomite treatment were superior to the poor growth then obtainable after repeated applications of phosphate. When 4 cwt. of superphosphate (T13) were used in conjunction with the cement treatment, the increased supply of phosphate did not produce a large increase in growth, as did the combination of 4 cwt. of superphosphate with the dolomite treatment (T15). The addition of phosphate in the latter treatment enabled the grass to make better use of the excessive nitrate, and the yield was almost treble that of the dolomite treatment. The addition of 3 tons of dolomite did not impair the availability of the minor elements native to the soil, since the addition of these nutrients (T16) produced no beneficial effects.

Italian Rye Grass at Second Cut.

1.—Control.
4.—4S.
7.—4S, pellet.
8.—8S, pellet.
5.—8S.
6.—8S, mixed.

1 4 7 8 5 6

10 11 12 13 14 15

11.—6SS, M.
10.—12SS.
12.—2 tons cement.
13.—2 tons cement, 4S.
14.—3 tons D.
15.—3 tons D, 4S.

The opinion is held by some residents in the laterite areas that ground basalt has a beneficial effect on lawns and pasture. Finely ground olivine basalt was added at the rate of 4 tons per acre 8 inches, and mixed throughout the soil. In the form of apatite, phosphate equivalent to that in 240 lb. of superphosphate was added in this material, but little effect on growth resulted, and in conjunction with 4 cwt. of superphosphate (T18) results were inferior to 4 cwt. superphosphate alone.

The inclusion of sodium silicate and cement in the experiment was designed to reveal any pos-

sible displacement of the native phosphate by silicate. The result from 1 ton of sodium silicate used in conjunction with 4 cwt. of superphosphate (T19) was similar to 4 cwt. superphosphate alone, so that there was no additive effect of displaced phosphate or any apparent tendency to preserve the mobility or prevent the fixation of the phosphate of superphosphate.

Phosphate Content of the First Cut.

The amount of phosphate in the first cut was relatively high. The percentage of phosphate was lowest in the cuts from the untreated soil and that receiving minor elements only. When compared with the low values in the second cut, high phosphate content appears to be an inherent feature of the early growth period of rye grass, otherwise, as happens later, an inadequate supply of phosphate could be diluted in a larger amount of tissue. In the second cut, tissue elaboration is related almost to the minimum phosphate content required for growth. The same feature applies to nitrogen nutrition.

The grass growing in cement- and dolomite-treated soils had a phosphate content comparable with most of the phosphate treatments. The highest phosphate content was recorded in the material from the 8 cwt. superphosphate pellet treatment. Some nine months after contact with moist soil the remnants of these pellets were found to be highly intruded by fine roots, but water-soluble phosphate could be leached from them. In the light of this long term availability of the pellet phosphate, contact of a greater number of roots with smaller phosphate particles appears to be more efficacious in plant nutrition on these soils than the contact of fewer roots with more abundant local supplies of phosphate. Very poor net returns of applied phosphate were recorded from the treatments—8 cwt. superphosphate mixed through the soils (T6), 4 cwt. superphosphate in pellets (T7) and the basalt-superphosphate mixture (T18).

Features of the Second Cut.

The principal feature of the second cut was the production of a large amount of tissue of poor quality from a grazing standpoint and characterised by low phosphate (and nitrogen) content. The behaviour of the untreated soil indicates that grass is able slowly to absorb phosphate and elaborate tissue containing phosphate at the minimum level for growth, and that over a period a good yield may be obtained. With the removal of nitrate-intoxicated tissue, yields of grass are highest on soils treated with cement or dolomite only and little difference is found in the yields from the various phosphate treatments. Following increased ramification of roots, the results from the treatment in which 8 cwt. of superphosphate are mixed through the soil are much in advance of those recorded in the first cut. This suggests that the poor initial results were due, not alone to rapid fixation arising from extensive contact of the phosphate granules with the soil, but also to the delay in the roots contacting the particles. Arising from the higher yields, the net absorption of phosphate from the cement- and dolomite-treated soils is much higher than in the first cut, but there is a considerable diminution in most of the phosphate treatments, due to the low phosphate content of the second cut. This fact points to the low availability of the phosphate remaining in the soil after the first period of growth.

TABLE 2.—SECOND CUT—151 DAYS AFTER THE FIRST.

Treatment.	Yield dry grass	Percentage P_2O_5 in grass.	P_2O_5 absorbed	Net P_2O_5 absorbed
	gm.		mgm.	mgm.
1 Control	81·63	0·192	156·6	......
2. Control, M	80·3	·189	163·7	......
3. 4S, M	110·32	·208	230·3	73·7
4. 4S	105·14	·226	238·5	81·9
5. 8S	112·88	·235	265·5	108·9
6. 8S mixed	108·52	·240	260·5	103·9
7. 4S pellet	94·84	·247	234·4	77·8
8. 8S pellet	118·32	·201	238·5	81·9
9. 6SS	100·09	·208	210·7	54·1
10. 12 SS	109·07	·244	267·0	110·4
11. 6SS, M	104·10	·235	245·0	88·4
12. 2 tons C	129·3	·232	301·0	144·4
13. 2 tons C, 4S	114·86	·252	289·6	133·0
14. 3 tons D	127·92	·201	257·7	101·1
15. 3 tons D, 4S ...	114.12	·258	294·3	137·7
16. 3 tons D, 4S, M ...	96·11	·278	267·4	110·8
17. 4 tons B	77·4	·220	170·8	14·2
18. 4 tons B, 4S	98·81	·225	222·9	66·3
19. 1 ton Sil., 4S... ...	109·94	·230	253·2	96·6

Effect of Phosphate Placement. Italian Rye Grass at First Cut.

Left to Right.—
Control.
4S, surface.
4S, at 1 inch.
4S, at 2 inches.
4S, at 3 inches.
3 tons D, previous year.

Combined Yields and Recovery of Added Phosphate.

The marked effects of treatments at the first cut is masked in the combined cuts. While contributing no worthwhile amount of good quality material the red laterite appears capable, over a long period, of producing an amount of herbage not greatly inferior in weight to that on the treated soil.

The dolomite and superphosphate, dolomite and cement alone, and the heaviest superphosphate and serpentine superphosphate treatments (T15, 14, 12, 5, 10) produced the greatest amount of plant material. Superphosphate applied at the rate of 4 cwt. per acre in pellet form and superphosphate

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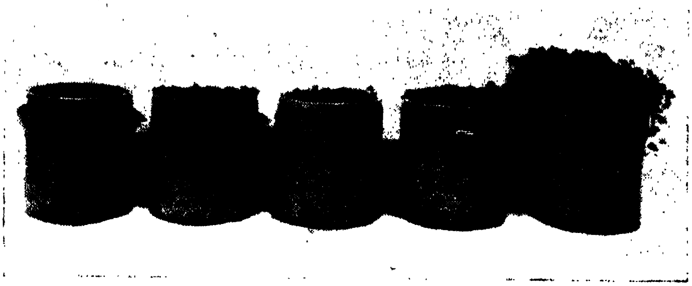
mixed with ground basalt gave outstandingly poor results. The recovery of phosphate from the 4 cwt. superphosphate and the 4 cwt. serpentine superphosphate treatments was of the order of 30 per cent. of that applied. When these materials were used at double this rate the recovery fell to 22 per cent. Recovery in the 8 cwt. superphosphate pellet treatment was only 16 per cent. and from the 8 cwt. superphosphate mixed with the soil, only 11 per cent. was recovered.

The recovery values shown in Table 3 for cement and 4 cwt. of superphosphate (T13) and dolomite and 4 cwt. of superphosphate (T15, 16) are apparent values. If the phosphate absorbed due to the cement effect alone (T12) is subtracted from Treatment 13, the recovery from 4 cwt. superphosphate in the presence of cement is only 2.5 per cent. In effect, the superphosphate was without influence in the presence of cement. Similarly if the phosphate absorbed due to the dolomite treatment is subtracted from the apparent recovery from the dolomite and 4 cwt. superphosphate treatment, the recovery from the superphosphate is reduced from an apparent 52.9 to 29.9 per cent., which is practically identical with the value of 30.1 per cent. obtained from 4 cwt. of superphosphate. The recovery from Treatment 16 is reduced from 50.7 to 27.7 per cent., which likewise agrees well with the 28.5 per cent. recovery from 4 cwt. of superphosphate and minor elements (T3).



Final phase of Decline. White Clover, Flowering Stage.

Left to Right.—

Control.
4S (third).
4S (third), Mo.
3 tons D (2 years before).
3 tons D, 4S (first crop).

TABLE 3.—COMBINED CUTS.

Treatment.	Soil Reaction at End of Experiment.	Yield, Dry Grass.	Net P_2O_5 Absorbed.	P_2O_5 Added.	Percentage Recovery of Added P_2O_5.
		gm.	mgm.	mgm.	
1. Control	4·45	87·35	...	0	...
2. Control, M ...	(at outset 4·85)	91·26	...	0	...
3. 4S, M	...	135·60	188·9	662	28·5
4. 4S	4·45	128·74	199·5	662	30·1
5. 8S	4·50	143·62	286·8	1,324	21·7
6. 8S mixed ...	4·40	121·52	148·4	1,324	11·2
7. 4S pellet ...	...	108·22	140·7	662	21·3
8. 8S pellet ...	...	140·75	215·1	1,324	16·3
9. 6SS	4·53	123·69	166·5	662	25·2
10. 12 SS	4·50	141·39	291·0	1,324	22·0
11. 6SS, M	...	129·45	203·3	662	30·7
12. 2 tons C	5·62	146·84	228·5	43	...
13. 2 tons C, 4S ...	...	134·01	244·8	662	37·0*
14. 3 tons D ...	5·60	141·34	152·3	0	...
15. 3 tons D, 4S ...	...	152·12	350·5	662	52·9*
16. 3 tons D, 4S, M...	5·70	134·51	335·9	662	50·7*
17. 4 tons B ...	4·70	85·27	30·1	359	8·4
18. 4 tons B, 4S ...	...	116·40	143·9	1,021	14·1
19. 1 ton Sil., 4S ...	4·70	122·09	224·1	662	33·8

* Apparent recovery.

Nitrogen Content of the Cuts.

The results recorded in Table 4 show the high nitrogen content of the first cut, and the presence, in all cases, of a considerable concentration of nitrate nitrogen. It will be seen however, for reasons advanced, that nitrate was present in toxic amounts in the cuts from the cement- and dolomite-treated soils. Although after the first cut, sulphate of ammonia at the rate of 2 cwt. per acre was applied to all soils, the nitrogen in the second cut samples was at the minimum necessary for growth.

TABLE 4.—NITROGEN CONTENT OF CUTS.

Treatment.	NH_3-N*	NO_3-N†	Total Nitrogen First Cut.	Total Nitrogen Second Cut.
	per cent.	per cent.	per cent.	per cent
1. Control	0·12	1·00	4·30	0·67
4. 4S	·09	0·87	4·15	·68
5. 8S	·08	·63	3·90	·59
8. 8S pellet	·11	·95	4·15	·61
10. 12 SS	·08	·77	3·89	·61
12. 2 tons C	·09	1·45	4·73	·64
14. 3 tons D	·10	1·62	5·18	·64
15. 3 tons D, 4S ...	·09	1·09	4·46	·65

* Ammonia nitrogen.
† Nitrate nitrogen.

Calcium and Magnesium Content of the Cuts.

In the first cut the phosphate treatments appear to contribute a little calcium to the grass grown in this very lime-deficient soil. The cement treatment results in a marked increase in the lime content, as to a lesser degree do the dolomite treatments. The content of magnesium is constant in the treatments other than those including dolomite, which is responsible for doubling the magnesium content. In the second cut there was a slight rise in the calcium content of the grass from those soils receiving no liming materials, but a marked fall in calcium content in the grass grown on the cement- and dolomite-treated soils, thus tending to produce an equalisation of calcium values. Irrespective of treatment, magnesium values in the second cut are only half of those in the first cut.

TABLE 5.—CALCIUM AND MAGNESIUM CONTENT OF CUTS.

Treatment.	First Cut.		Second Cut.	
	CaO	MgO	CaO	MgO
	per cent.	per cent.	per cent.	per cent.
1. Control	0·44	0·34	0·52	0·19
2. Control, M	·41	·33	·51	·20
3. 4S, M	·54	·39	·57	·19
11. 6SS, M	·52	·33	·49	·19
12. 2 tons C	1·14	·39	·78	·18
14. 3 tons D	·87	·70	·57	·27
15. 3 tons D, 4S ...	·90	·69	·66	·30
16. 3 tons D, 4S, M ...	·89	·72	·69	·36

Weight of Roots.

The dry weight of the roots at the conclusion of the experiment indicates that phosphate in the absence of a satisfactory calcium supply, has had little influence on root development and even a repressive effect when there is a heavy local concentration of phosphate (T5). The influence of calcium is observed in increased root development in the dolomite treatment (T14), and an outstanding development results from the combination of dolomite and phosphate (T15).

TABLE 6.—DRY WEIGHT OF ROOTS.

Treatment.	Roots.
	gm.
1. Control	28·0
3. 4S, M...	30·5
5. 8S	22·4
6. 8S mixed	38·5
7. 4S pellet	32·7
8. 8S pellet	36·0
12. 2 tons C	39·6
13. 2 tons C, 4S	34·4
14. 3 tons D	42·2
15. 3 tons D, 4S	51·2
18. 4 tons B, 4S	28·5

Subsequent Experiments.

In the year (1944) following the experiment recorded above, some of the soil used in that experiment was employed as part of one in which phosphate placement in a number of laterites was studied. The control previously employed and the dolomite-treated soil were again cropped.

In examining the importance of placement, 4 cwt. applications of superphosphate were made on the surface and in planes at a depth of 1, 2 and 3 inches. Results are shown in Table 7.

Yields in both the first and second cuts of the phosphate-treated soils were very uniform. The control produced practically no growth up to the time that the phosphate-treated pots were first harvested, but as in the previous year, had made an amount of growth at the second cut which approached that of the phosphate treatments, and in view of the low availability of the residual phosphate, absorbed an amount again approaching that taken up from these treatments.

In the second cropping period, while having received no phosphate, the dolomite-treated soil yielded the highest weight of plant material at each cut. More phosphate was absorbed from the dolomite-treated soil than from those receiving a second application of 4 cwt. of superphosphate per acre.

TABLE 7.—SECOND YEAR PLACEMENT EXPERIMENT.

First Cut, 70 days after Sowing.

Treatment.	Yield, Dry Grass.	P_2O_5 Per cent.	P_2O_5 Absorbed.
	gm.		mgm.
Control	Little growth.	Not Harvested.	...
4 cwt. superphosphate, surface	24·39	0·32	77·0
4 cwt. superphosphate, 1" ...	24·89	·33	83·1
4 cwt. superphosphate, 2" ...	24·38	·40	97·5
4 cwt. superphosphate, 3" ...	20·59	·40	82·4
3 tons dolomite previous year	27·04	·35	94·1

Second Cut, 132 days Later.

Treatment.	Yield dry grass.	P_2O_5	P_2O_5 absorbed	Net P_2O_5 absorbed
	gm.	per cent.	mgm.	mgm.
Control ...	32·7	0·25	80·4	......
4 cwt. superphosphate, surface	45·0	·22	98·2	17·8
4 cwt. superphosphate, 1"	44·2	·24	106·1	25·7
4 cwt. superphosphate, 2"	46·2	·24	111·9	31·5
4 cwt. superphosphate, 3"	47·8	·21	102·0	21·6
3 tons dolomite previous year	48·5	·25	123·2	42·8

Combined Cuts.

Treatment.	Yield dry grass.	P_2O_5 added.	Net P_2O_5 absorbed	Per cent recovery of added P_2O_5
	gm.	mgm.	mgm.	
Control	32·7	0	......	......
4 cwt. superphosphate, surface	69·39	662	94·8	12·8
4 cwt. superphosphate, 1"	69·09	662	108·8	16·4
4 cwt. superphosphate, 2"	70·58	662	129·0	19·5
4 cwt. superphosphate, 3"	68·39	662	104·0	15·7
3 tons dolomite previous year	75·54	0	136·9	....

Superphosphate placed at 2 inches depth gave the highest percentage recovery, but the results in the second year were considerably poorer, both as regards yield and percentage recovery of added phosphate.

These results demonstrate the rapid decline under intensive mineral removal which takes place in the red laterite, despite the adequate provision of phosphate. The intensification of the lime deficiency and the inadequacy of the lime applied in the phosphate to counteract losses, bring about a rapid decline in productivity. The marked similarity in results obtained from phosphate placement on the surface or at levels down to 3 inches, shows that placement, under the conditions of a pot experiment where the water supply is not allowed to become a limiting factor and where the roots produce a felted mat on the surface of the soil, is not a significant factor in phosphate nutrition. A very different picture

of placement in the field, however, will be demonstrated in later experiments.

The Final Phase in Cropping Decline.

A year later (1945) as part of an experiment to determine the value of molybdenum in the red laterites, a few of the soils then twice previously cropped, were included. Since effects with molybdenum are anticipated chiefly with legumes, White clover was used as a crop in place of the Italian rye grass previously used. Details of the final crop are shown in Table 8.

TABLE 8.—YIELD OF WHITE CLOVER, GROWTH PERIOD 200 DAYS.

Treatment.	Yield, Dry Clover.	P_2O_5	P_2O_5 Absorbed.	Net P_2O_5 Absorbed.	Recovery of Added Phosphate.
	gm.	Per cent.	mgm.	mgm.	Per cent.
Control	3·4	0·581	19·7	...	...
4 cwt. superphosphate	27·4	·644	176·4	156·7	23·7
4 cwt. Superphosphate + 4 ozs. MoO_3 ...	25·4	·663	168·4	148·7	22·5
Dolomite	32·3	·504	162·8	143·1	...

The final phase of deterioration of the untreated laterite under intensive cropping was reached in the third year when it practically failed to support any growth of White clover, the most suitable pasture legume for the Big Scrub laterite. Molybdenum was without effect in increasing the yield of clover. The persistent effect of dolomite was again recorded in the fact that following two exacting crops, completely removed, and receiving no phosphate, the original application proved more effective than the third application of 4 cwt. of superphosphate which some treatments had now received. The calcium content (2.13 per cent. CaO) and magnesium content (0.80 per cent. MgO) of the clover from the dolomite-treated soil were each more than double those in the clover from any other treatments. The figures purporting to show a satisfactory recovery of phosphate by the White clover are not valid, since the control soil had given up little phosphate and a true comparison should be made with a soil which had previously received two applications of phosphate.

Summary.

The effect of various phosphate treatments in promoting pasture growth on an acid, base-impoverished red laterite, and the influence of liming materials on the utilisation of the large amount of native phosphate have been studied over three cropping periods.

The initial cropping period demonstrated that 4 cwt. and 8 cwt. applications of ordinary superphosphate promoted large increases in yield during the early stages of growth, but that 8 cwt. distributed through the soil to a depth of eight inches, or 4 cwt. as ½-inch pellets at three inches depth, gave very unsatisfactory results. New Zealand serpentine superphosphate, employed at one and a half times the rate of superphosphate to give equivalent applications of phosphate, reacted in much the same manner as superphosphate, but disclosed no advantages warranting its use in this type of soil.

Minor elements proved of advantage in no circumstances.

Liming materials in the form of dolomite and cement, although introducing the factor of nitrate toxicity, produced large yields of plant material and by the removal of a calcium deficiency, permitted the uptake of a considerable amount of native phosphate. Superphosphate used in conjunction with dolomite was very effective, but in the presence of cement gave no stimulus to growth.

Ground basalt was ineffective, and its presence lowered the effectiveness of superphosphate.

The phosphate content of the first cut was high, but with reduced availability following fixation, the amount in the second cut was little above the minimum required for tissue production. The highest recovery of added phosphate was about 30 per cent. from the 4 cwt. superphosphate treatment, but only 11 per cent. was recovered from the 8 cwt. superphosphate mixed through the soil.

Dolomite and cement had a marked influence on the uptake of calcium and magnesium by the grass, especially in the early stages of growth. Calcium had a greater influence on root growth than phosphate, but the combination of adequate phosphate and calcium promoted the greatest root development.

Placement of phosphate on the surface or at levels down to 3 inches depth was without significant effect, showing that in pot experiments, where the water regime is optimum and a felt of roots develops over the surface, conditions are such as seldom exist for long in the field.

The dolomite-treated soil in its second cropping period produced better results than a second application of 4 cwt. superphosphate, and in a third cropping period gave a better crop of clover than the soil receiving a third application of phosphate or a similar treatment combining molybdenum. During the third cropping period the untreated laterite failed almost completely to support plant growth. The persistent effect of dolomite emphasises the importance of base replenishment in any project for the permanent rehabilitation of the red laterite soils.

The Growing of Oats—*continued from page 289.*

A planned cropping programme as to areas, kind and quantity of fodders, varieties, etc., removes much of the gambling from farming, and oats can play a most important part in such a programme on the wheat farm.

(*To be continued*).

Pruning of Vines and Selection of Cuttings for Spring Grafting.

JUNE and July are the two usual months for pruning grape vines since it is preferable to allow the leaves to fall and the wood to harden before starting.

The two principal methods of forming young vines are:

1. The bush, staked system, in which the vines are pruned to spurs.
2. Spalier systems in which two arms are formed, one on either side of the stem, and the vines trellised.

Spaliers are formed for annual rod and spur pruning and also to carry spurs. This system is fairly extensively used for table grapes such as Muscats.

A third system (the cordon), which has only one main arm trellised horizontally, is simple to form, but it is not recommended except in special circumstances and in some instances under rich soil conditions. Under ordinary conditions it is far better to have the two short permanent arms.

In the forming of young vines the inexperienced grower sometimes makes the mistake of leaving the young arms long. The best practice is to extend the main arms gradually each year until the desired length is reached and not endeavour to obtain the full length in one year or two years. By this gradual lengthening a more even break of the buds along the young arms is secured, and it is possible to choose and space the spurs at regular intervals when pruning.

During the pruning period cuttings should be selected and held for the spring grafting of any phylloxera-resistant stocks that have missed the yema bud. The cuttings should be preserved in soil, preferably sand, which must neither be too moist nor too dry. Soil too moist will cause the buds to shoot, and if it is excessively damp the cuttings will rot. On the other hand, if the sand is too dry the cuttings will shrivel and eventually dry up.

In small areas and under favourable conditions certain vines can be left till August, and the scion wood taken directly from the vines and used almost immediately for grafting.

With labour still not easy to obtain, growers should take every advantage of weather conditions and keep the work as much ahead as possible. Any delay can mean a big decrease in yields.—H. L. MANUEL, Viticultural Expert.

Good Orchard Ladders Save Time and Labour.

IN most orchards the ladder is almost always used for the picking of fruit and the pruning of trees, and a good serviceable type should, therefore, be provided. In many orchards one sees a huge heavy ladder which one man shifts from tree to tree with difficulty, and it is so constructed that it cannot be conveniently placed to enable the operator to carry out his work expeditiously. Such a type of ladder often damages fruit spurs and fruit when being placed in position.

Orchardists should take stock of their ladders, and, if they have not done so already, they should secure a strong, light, serviceable ladder, the use of which will economise time and labour.

A useful type of orchard steps consists of a tapering ladder 10 feet long, 3 feet 6 inches wide at the base and about 9 or 10 inches wide at the top, supported by a single pole. It is not necessary to use sawn timber in its construction. It can easily be made by anyone who is handy with tools from round timber, which is often obtainable in the neighbourhood of the orchard.

Agricultural Societies' Shows.

SECRETARIES are invited to forward for insertion in this list dates of their forthcoming shows; these should reach the Editor, Department of Agriculture, Box 36A, G.P.O., Sydney, not later than the 15th of the month previous to issue. Alteration of dates should be notified at once.

1946.

Albury Sheep Show (A. G. Young) August 6, 7
Condobolin (N. J. Hanlin) ...... August 6, 7
Trundle (W. A. Long) .... August 13, 14
Peak Hill (C. McDowall) ...... August 20, 21
Parkes (L. S. Seaborn) .... August 26, 27, 28
Forbes (J. T. Woods) .... September 3, 4
Manildra (E. S. Parker) ...... September 3, 4
Young (T. A. Tester) .... September 3, 4
Coolamon (R. G. Lynch) .... September 6, 7
Narrandera (T. L. Bull) ...... September 13, 14
Murrumburrah (R. J. Simpson) September 24, 25
Grafton (C. W. Creighton) September 26, 27, 28
Ardlethan (E. C. Knight) .... September 27
Mangrove Mountain Agricultural
Bureau (W. J. Mitchell) ...... September 28
Walbundrie (C. Lieschke) .... October 2
Albury (A. G. Young) .... October 8, 9, 10

AN APPRECIATION OF—

THE AUSTRALIAN WOMEN'S LAND ARMY

For Services Rendered at Batlow and Other Fruit-growing Districts.

E. C. WHITTAKER, Fruit Instructor, and
P. B. MACKENZIE, Fruit Inspector.

Australian Women's Land Army Girls Harvesting Pears

AT the beginning of 1942 it was obvious that in many fruit-growing centres there would be a serious shortage of labour during the coming fruit season and later. Nowhere was this more apparent than in the Batlow area where fruit crops were particularly heavy and the usual sources of seasonal labour were by this time so depleted, owing to the demands of the Forces and war industry generally, that growers were faced with the alternative of finding further suitable labour or losing a large proportion of their crops.

Accordingly at this time the Management of the Batlow Packing House entered into negotiations with the Director of the Women's Land Army (Mrs. A. Lynch) regarding the allotment of members of that Organisation to the Batlow District for general orchard work and particularly picking, grading and packing.

The result of these negotiations was that from the beginning of March, 1942, about 80 to 100 girls of the Australian Women's Land Army were employed throughout the district during that season, some at the Central Packing House and Batlow Growers' Co-operative Shed as packers and graders and the majority on the various orchards as pickers.

These girls were drawn from all walks of life and very few had had any practical experience of agricultural work previously; hence it is all the more to their credit that on the whole their work during that and subsequent seasons was eminently satisfactory.

As in other districts the principal initial difficulty was that of suitable accommodation for the girls. This was solved in this particular case by the Central Packing House taking over and completing the partially built Returned Sailors, Soldiers and Airmens' Imperial League of Australia Memorial Hall and the Scouts Hall and fitting them up as sleeping quarters and mess room respectively.

Later, as the numbers of girls increased it was found necessary to establish hostels on various orchard properties in different parts of the district, and towards the end of the war, when some 350 girls were employed in the area, no less than fourteen hostels

BATLOW GROWERS EXPRESS THEIR GRATITUDE.

THE *work of the Australian Women's Land Army in the Batlow district during the war years will always be gratefully remembered. It will be a pleasant memory as well, for many fine girls have been at Batlow and they will be remembered, not only for their service, but for their cheerfulness, good humour, grace and charm. There have been a few who found it difficult to adapt themselves, but most of these changed with good companionship from their own sex and good direction from their Matrons. No matron has perhaps had a greater influence than Mrs. Lester, who was Supervising Matron, during the last two war years.*

So much for the human side of the story. As for the work carried out, this covered a very wide range—from every sort of outside work to a concentrated effort on inside work. For instance, apart from having 300 girls located at Batlow, we also had 30 odd at Tumbarumba last winter who were engaged in picking up potatoes behind a mechanical potato digger drawn by a tractor. The girls did this job surprisingly well, and in my opinion better than men. At the other end of the scale there were 40 girls at Kingsvale, who worked the whole of last year on the various jobs connected with the dehydration of potatoes, of which trimming the peeled potatoes was the main job. To carry out this work for months on end was no mean undertaking.

At Batlow every type of farm and orchard work was undertaken, and in addition a lot of inside work connected with dehydration of potatoes, carrots and cabbage, the canning of apple juice and orange juice, and the grading and packing of apples and pears amounting to some 300,000 bushels per year.

The plain fact is that without the girls this work could not have been carried on, and this in turn would have meant—

1. That growers and their families would have had a very lean time, and suffered much loss;

2. That food supplies would have been much less, and consequently the war effort would have suffered;

3. That the general level of prosperity of the district, including all business establishments would have been very much less indeed.

The primary motive actuating the girls in this work was a desire to help Australia in her fight, and from this deep-seated and strongly-held feeling a splendid effort resulted, of which all true Australians can be proud.

It was with considerable regret that I viewed the official disbandment of the Australian Women's Land Army in December, 1945, because I believe there is room for a peace-time Australian Women's Land Army to assist in primary production, and in that secondary production which is associated with the processing of primary produce. Many of our city girls, want and need a life in the country, and Australia needs the dispersal of her population over country areas and in secondary production in those areas, as well as primary.

This year, 1946, we have an unofficial Women's Land Army at work in the Batlow district. Many Australian Women's Land Army girls are amongst them, having felt the lure of the bush and country ways too strong for the city life they were used to. They have a contribution to make to Australia's progress as a nation, and I believe they will continue to serve where they are given any reasonable encouragement.

On behalf of the Management of the Batlow Packing House Co-operative Limited, and of our growers, directors and shareholders, I thank the Australian Women's Land Army very much for a very fine effort.

H. V. SMITH,
General Manager,
The Batlow Packing House Co-operative Ltd.

had been established, in addition to a very fine building established in the township and used as local Women's Land Army Headquarters. This was known as "The Lady Wakehurst Hostel" and was built by the Central Packing House at a cost of several thousand pounds.

Although primarily the girls were engaged for orchard and packing shed work, they have also rendered sterling assistance to the vegetable growers in this district in work such as potato planting, transplanting of seedlings, weeding, carrot digging, etc., and to the Packing Shed's subsidiary concerns established for potato dehydration and apple and orange juice extraction.

At the beginning, naturally, there was a certain amount of prejudice amongst growers against employing the Women's Land Army girls—especially on outdoor work—but as time went on the general good conduct of the girls coupled with their willingness to undertake almost any and every job on the farms tended to break down such prejudices, and after a season or two there were very few growers who had not employed the girls at some time or other with mostly quite satisfactory results.

Apart from Batlow, members of the Australian Women's Land Army rendered sterling service to growers in other fruit districts, notable the Murrumbidgee Irrigation Area, Young and Gosford, besides various small centres.

The Lady Wakehurst Hostel at Batlow.

Some of the girls showed outstanding aptitude and capability for most jobs on the farm; others owing to temperament or physique proved more suitable for some specialised types of jobs, but with very few exceptions the girls as a whole did their best under what must have been to most of them very trying conditions

The Australian Women's Land Army was disbanded at the end of 1945 and thus

(Continued on page 309.)

Efficient Spraying is Essential to Successful Fruit Production, But it is Not an Easy or Nice Clean Job.
Land Army Girls at work among pears at Batlow.

FRUIT GROWING.

PINEAPPLE GROWING

A Means of Diversification of Sub-tropical Fruit Culture.

(*Continued from page* 238.)

H. W. EASTWOOD, H.D.A.,
Special Fruit Instructor.

IN the first portion of this article, which appeared in May issue, the author stressed the striking difference in the areas devoted to bananas and pineapples in recent years in the North Coast areas of New South Wales, despite the suitability of soil and climate to both fruits, and indicated the dangers of single crop production on many plantations.

Suitable soils and climate, methods of soil preparation and selection of planting material for pineapples were discussed.

Planting.

As the pineapple plant is a surface rooter it should be planted shallow. Suckers should be set about 3 or 4 inches deep, according to size, and slips or tops not quite so deep. By their nature, slips and tops are difficult to plant too deeply, and this is one reason why they normally make better plants than suckers. After sorting out the suckers into large and small to avoid competition between plants of different sizes to the detriment of the smaller, they may be dropped along the rows by one man, while another follows and plants by making a hole with a dibbler with the left hand and pushing the sucker into the soil with the right hand. The soil, which should be in good tilth, is firmed around the plant with the feet. All planting is best done on the level except where it is necessary to form low, flat ridges to assist drainage on low-lying heath or peat country.

The land should be pegged out at the required distances and a line stretched between top and bottom pegs. Care should be taken, when planting, to prevent the soil entering the heart leaves of the plant, as this will at least retard the growth if it does not kill the plant.

In a Pineapple Plantation on the North Coast.

Spacing.

Wide spacing of double rows about 9 feet apart, as practised in the past, has given way to closer plantings. Unless the widely spaced rows were planted in very fertile soils and heavily fertilized they seldom closed up. Much land was, therefore, unused, and labour had been employed in clearing this land and was required for its cultivation. The unshaded, exposed soil between the rows lost its fertility for replanting.

Experience has proved that pineapple plants, as individuals, do better when planted close together. As the pineapple plant is shallow-rooted it is necessary to keep the surface layer of soil cool and moist. One way to accomplish this is to set the plants sufficiently close to shade the soil around them, at the same time allowing each plant sufficient space to spread its leaves and receive the maximum sunlight.

Trials have shown that bare soil loses as much moisture by evaporation as would be transpired by pineapples growing thereon.

There are two popular methods of planting—single rows and double rows—but the latter is the better for the smooth-leaf Cayenne. Usually the double rows are set 2 feet apart and the plants placed 1 foot apart in the rows. The distance between the centres of double rows depends on the fertility of the soil. As close as 6 feet is proving satisfactory for deep, well-drained sandy loams. This leaves 4 feet between the outside plants of two rows. The plants should be spaced wider apart in the rows—up to 18 inches—in heavier and colder type soils, which will allow more sunlight amongst the plants.

A planting line is stretched between the pegs, which are 6 feet apart, and the suckers are planted at the correct distances, 1 foot on each side of the line; not opposite each other, but staggered, that is, the plants in one row are midway between the plants in the other row.

Rough varieties, such as Common Queen and Ripleys, on account of their prickly leaves and prolific suckering, are better suited to single row planting, 4 feet apart.

Planting double rows two feet apart, with plants 1 foot in the rows, and 4 feet inter-row spacing, requires 14,520 plants per acre. Single rows planted 4 feet apart, with plants 1 foot in the rows, needs 10,890 plants per acre. If the plants are spaced 18 inches apart in the rows and the other distances are the same, the number of plants required will be 9,680 and 7,260 for double- and single-row plantings respectively.

Heavy yields per acre are obtained by close planting and intensive culture. With this method the leaf tips will soon meet and shade the intervening soil, which is a definite advantage in minimising the wasteful destruction of the humus by the action of the sun.

Close planting, shorter rotations and proper fertilizing produce more fruit with less overhead costs than wide spacings and a longer rotation. At the end of the rotational period the land is in a better physical condition for replanting and there is a large supply of good planting material.

Planting Time.

Except the period from April to August pineapples can be planted at any time. September and October are good months, provided there is sufficient moisture in the soil for the plants to root quickly, when they will make good growth during the maximum period of warm and hot weather which follows. If the spring months are dry and soil moisture is deficient, planting can be delayed until November or December. Planting later than December is preferred by some growers, because the rainfall is more reliable and planting material is easier to obtain. It should not be so late that the plants do not become well established before the winter.

Cultivation.

The root system of the pineapple is shallow and consequently deep cultivation near the plants will seriously injure them. Do not cultivate any deeper than circumstances demand, as all that is necessary is to keep down weed growth and break the surface of the soil. All cultivation should be done by hand, except during the first few months after planting, when any flush of weed growth can be destroyed by the use of a light and narrow spring-tined cultivator down the centres of the rows. Dutch hoes are preferable to other tools, but they must be used carefully to avoid damage to plants; chipping hoes are more suitable for heavy weed growth and inexperienced labourers.

While the plants are young the soil should be levelled off during the hoeing; as they get older, the soil should be worked up to the plants rather than away from them, but only under special circumstances is deliberate hilling-up advisable. This would apply in older plantations where the plants are "leggy," when soil can be shovelled in amongst the plants to stimulate new root growths from nodes above the ground.

Paper mulch conserves soil moisture, reduces cultivation and weeding costs and increases yields. It is more valuable in districts of low rainfall and porous soils. The soil must first be worked to a fine, even tilth, and be in a moist condition before attempting to lay the material. Further reference will be made to paper mulch later on in this article.

Fertilizing.

Until recent years, mixtures containing appreciable quantities of organic ferilizers were generally advocated and applied before and after planting, and ploughed, dug or chipped into the soil as near to the rows as possible. As such mixtures were not water-soluble, they had to be well mixed with the soil to obtain the best results.

Established plantations do not lend themselves to fertilizing in this manner. With close planting, as practised to-day, a new type of inorganic, water-soluble fertilizer mixture and a different method of application has been evolved. This has been made possible because the plant can assimilate food material and absorb water through the embryo roots in the leaf axils, and this fact should be remembered when fertilizing under modern methods.

Three main elements are supplied in fertilizers—nitrogen, phosphoric acid and potash. Previously the first two plant foods were usually applied as blood, bone and meatworks manure, and in this form they are not readily available to the plants. With the new practice of applying fertilizers in water-soluble form, the formula 10-6-10 is generally used as the most suitable. This consists of a mixture of sulphate of ammonia, superphosphate and sulphate of potash. The fertilizer is thrown into the lower leaves at ground level, the aim being to place it in the lowest leaf bases. With practice it is possible to give each plant a small quantity, which gradually dissolves in rain and dew, when it quickly becomes available and is taken up by the roots. Some of the fertilizer will fall on the ground close to the plants.

The first application in newly planted areas should be spread low down to avoid damaging the tender centre leaves of the plants. This important dressing, of 30 lb. to every 1,000 plants, is applied shortly after planting; subsequent applications are made at the rate of 40 lb. per 1,000 plants. Four applications during the year are advisable—in September, January, early April and mid-June. This programme can be varied by substituting straight sulphate of ammonia for the January and mid-June applications in order to hasten the growth of backward suckers.

Brown Paper Bags on Pineapples.

Although farmyard manure is difficult to obtain, every effort should be made to use what is available. Besides adding humus to the soil it also supplies small quantities of plant food. Cow manure is fairly plentiful in pineapple districts, and could be utilised much more than it is. Even small quantities of farmyard manure have a beneficial action on the soil, and artificial fertilizers can be reduced in proportion to the quantity of natural manure used. It should be well rotted and applied as a mulch over the soil, which it will keep cool and moist, besides encouraging good root development.

Sucker Selection.

The only practical way of reproducing pineapple plants and increasing plantings normally, is by asexual methods, and by this means plants are reproduced which are in every way similar to the parent plant. The pineapple plant has a strong tendency to produce variations or sports of the parent plant. These bud mutations are frequently found, and they give rise to different characteristics which may be superior or inferior to the parent plant.

If a close examination is made of the plants on their first crop, many variations in growth and fruit will be noticeable. All inferior types should be culled out so that they will not be further propagated. Only plants of desirable types should be used for planting new areas, and all others should be discarded. In selecting types from which propagating material should be chosen it is necessary to look for good size and shape of fruit, low stature of plants, free suckering, early maturity and resistance to disease. Inferior types include "bottle tops," "long toms," "collar of slips," "cripples" and "narrow leafs."

At first growers must be satisfied to make the main planting from good average suckers, discarding all definitely bad types. Then a selection can be made of the best plants on the first crop, and these planted separately. If this procedure is continued yearly it will not be long before superior plants with the desired characteristics are obtained.

Thinning Surplus Growth.

Far too many growers neglect the thinning out of surplus suckers and robbers, and unless this is done the suckers in the rough varieties become so numerous that they lose their vigour and fail to produce good marketable fruit. The grower should develop the habit of going through row to row, during the late winter months, and cutting out all nibs and robbers from the pines unless they are required for planting. Once a plant has produced a pine, the old stumps above the sucker should be removed. A judicious thinning out of suckers is advisable, leaving the strongest and healthiest, the most evenly spaced, and those as close to the ground as possible to bear the crop. The suckers removed can be used for spring planting.

Wastage.

During very hot days sunburn is responsible for the loss of much fruit, and this can be reduced by growing low, sturdy plants, but additional safeguards are necessary. Woodwool is now generally used to protect the fruit, and is the most satisfactory material, being cheap and convenient, and not easily blown about. Dry grass also serves a similar purpose, and paper bags or sleeves are sometimes used. Pines going bad from sunburn soon rot if left on the plant, so they should be removed and destroyed. Losses from attacks by birds, rats and other rodents can be reduced by poisoning, but every care should be exercised if this treatment is practised.

Paper bags are also used to envelope pineapples from April to September, to minimise or prevent the effects of low temperatures which cause chilling of the fruit.

Bagging gives better results for this purpose than woodwool, dry grass or bracken fern. Ordinary brown paper bags of 12 lb. capacity, as used in retail shops, are pushed over the fruit and left in position. Although the bags fade to a dull yellow colour in a few months, their value is not impaired. A percentage of the bags become torn or damaged, but about half of them can be used the second time.

(To be continued.)

Removal of Arsenical Residues from Apples.

Experiments at Bathurst Experiment Farm.

(*Concluded from page* 248).

J. D. BRYDEN, Senior Orchardist, and E. G. HALL, B.Sc.Agr., Fruit Research Officer.*

EXPERIMENTS on the removal of arsenical residue on apples to reduce it to the prescribed tolerance have been conducted by the Department for some years. The trials described in this article (which commenced in April issue) were conducted at Bathurst Experiment Farm and mainly concerned the temperature of the washing solution.

It was shown that heating the washing solution assisted in the removal of the residue, but that to avoid excessive wash injury during and after storage, the temperature should not exceed 90 degrees Fahr.

Details of the 1940 trials and a summary of the results of the whole trial are given in this issue.

1941 Experiments.

The results from analyses for the determination of arsenic and lead residues obtained from tests carried out over a number of years had given an indication of the necessary procedure for the actual removal of residues. However, further information was desirable on the keeping qualities of the treated apples.

It was therefore proposed, in 1941, to investigate more closely the range of temperatures required to deal with heavy spray deposits without causing injury during storage.

Granny Smith apples were used for the 1941 tests and washing treatments were as follows:

1. Soaking 1 per cent. HCl, 2 minutes, 70-80°F., acid spray, rinsing spray.

2. Soaking 1 per cent. HCl, 2 minutes, 80-90°F., acid spray, rinsing spray.

3. Soaking 1 per cent. HCl, 2 minutes, 90-100°F., acid spray, rinsing spray.

4. Soaking 1 per cent. HCl, 2 minutes, 100-110°F., acid spray, rinsing spray.

Samples were cool stored at Homebush for five months at 34°F. and samples were also held in common storage at Bathurst Experiment Farm.

Cool Storage, Granny Smith, 1941.

The condition of fruit immediately on removal from cool store is shown in Table X.

The amounts and severity of acid wash injury increased with increasing bath temperatures, and there was over 40 per cent. of commercial wash injury at 100-110 degrees Fahr. Injury occurred around the calyx and stem and, to a lesser extent, laterally. The slight mould which was in evidence was not affected by treatment.

TABLE X.—Percentage Wastage in Granny Smith, ex Cool Store, 1941.

Treatment.	Total Wash Injury.	Commercial Wash Injury.	Moulds.
Check—No treatment. ...	0·0	0·0	2·4
1. HCl 1 per cent, 70-80°F.	6·8	0·3	4·7
2. HCl 1 per cent, 80-90°F.	33·8	5·0	4·4
3. HCl 1 per cent, 90-100°F.	77·6	24·2	6·0
4. HCl 1 per cent, 100-110°F.	87·0	43·2	3·1

TABLE XI.—Percentage Wastage in Granny Smith, ex Post Storage, 1941.

Treatment.	Injury plus scalds and lenticel spots.			
	Total.	Commercial	Mould.	Break-down.
Check—No treatment. ...	27·8	5·2	13·0	3·6
1. HCl 1 per cent, 70-80°F.	71·9	27·1	18·7	4·4
2. HCl 1 per cent, 80-90°F.	71·3	40·9	18·4	1·3
3. HCl 1 per cent, 90-100°F.	87·0	63·8	23·2	2·3
4. HCl 1 per cent, 100-110°F.	93·2	84·9	22·6	2·3

TABLE XII.—Details of Condition of Granny Smith Held in Common Store for 9 weeks After Treatment, 1941.

Washing Treatment.	*Calyx Injury.* Per Cent.	*Condition.*
1. 1 per cent. HCl—70-80° F.	12	Fruit in very good condition—injury very slight, few showing injury extending to cheeks. Acid injury not commercially significant.
2. 1 per cent. HCl—80-90° F.	38	Fruit in very good condition—injury slightly more pronounced and some extending to cheeks. Acid injury noticeable, but would not decrease commercial value to any extent.
3. 1 per cent. HCl—90-100° F.	91	Severe injury—some severe injury on cheeks and in stalk cavity. 50 per cent. fruits reduced in commercial value.
4. 1 per cent. HCl—100-110° F.	96	Severe injury—similar condition to Test 3.
Check—No Treatment	—	Fruit in very good condition.

* The analytical work in connection with these experiments was carried out by the late Mr. L. J. Wilson, B.Sc.Agr., Analyst.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During post storage there was a slightly more rapid development of mould in the washed fruit, but breakdown was not affected by treament. Some lenticel spot and scald developed, but was difficult to distinguish from lateral wash injury. However, from details of the condition ex post store, given in Table XI, it is apparent that either the wash injury increased or the lenticel spot and scalds on washed fruit were more severe than on untreated fruit. After post storage there was 80 per cent. commercially sound fruit in the untreated lot, but less than 10 per cent. of fruit treated at 100-110 degrees Fahr. was fit for sale.

Common Storage, Granny Smith, 1941.

Details of the condition of fruit held in common store for nine weeks is given in Table XII.

The information obtained largely confirmed previous results as to the effects of treatment temperatures. Increased acid injury corresponded to increases in the temperature of soaking solutions.

Previous experiments had shown weak solutions of hydrochloric acid to be effective in removing spray residue.

The present investigations were concerned mainly with the temperature of the washing solution and also with some other variations in the use of acid.

It was found that washing with a warm 1 per cent. solution of hydrochloric acid effectively reduced normal lead arsenate spray residues to below the prescribed tolerance of 1/100 grain of arsenic (as AS_2O_3) and 3/100 grain of lead (as Pb) per pound of fruit.

Washing in an 8 per cent. solution of sodium silicate was useful, but was only effective when followed by an acid spray.

Increasing the concentration of acid from 1 to 1½ per cent. did not significantly improve the removal of residues, but did considerably increase acid wash injury to the fruit.

Typical Acid Wash Injury on Granny Smith Apples, Developed During Cold Storage.

It will be noticed that in 1941, treatments 3 and 4 resulted in 50 per cent. of the fruit being reduced in commercial value after nine weeks common storage owing to the severity of acid injury. Observations showed that where very severe injury occurred, the skin was cracked and opened, allowing the entry of rot-producing moulds.

Summary.

Experiments on the removal of lead arsenate spray residues from apples after harvesting have been carried out over a period of three years.

Parallel storage tests were conducted in order to determine whether the washing treatments used injured the fruit or affected the development of wastage during both cool and common storage.

The removal of residues is considerably improved by heating the washing solution, but the storage experiments have shown clearly that, to avoid excessive injury to the fruit the temperature of the solution should not be higher than 90 deg. Fahr.

The addition of white oil to lead arsenate sprays increases the amount of residues on the fruit at picking and makes for great difficulty in reducing the residues to below the tolerance values.

It was found that soaking in 8 per cent. sodium silicate, followed by a second soak and a spray with 1 per cent. acid was effective with residues from lead-oil sprays, but injury to the fruit was excessive.

From the high level of injury which occurred in the various lots of fruit, and because much of

the injury was dark in colour, it is probable that soluble arsenic accumulated to an undesirable extent in the bath, and that in the machine used at Bathurst Farm, final rinsing was not adequate to remove thoroughly the acid or soluble arsenic from the fruit.

The various wash treatments did not, apart from actual acid, alkali, or soluble arsenic injury, affect significantly ordinary cool-storage wastage.

The important points to be observed in treating apples for the removal of lead arsenate spray residues* are:—

1. The fruit should be treated immediately after harvesting.

2. The fruit should be washed in a 1 per cent. solution of hydrochloric acid maintained at a temperature of 80-90 deg. Fahr.

3. After washing the fruit must be very thoroughly rinsed with clean water to avoid injury.

4. Clean receptacles, clear acid solution and plenty of fresh water for rinsing should always be used.

Discussion of Storage Experiments.

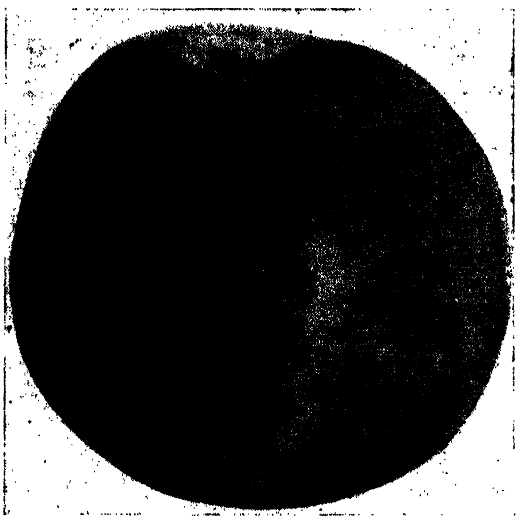
Practically all the treated fruit in all the tests developed a considerable amount of injury during storage. This is interesting as American workers have generally reported that washing in up to 2 per cent. hydrochloric acid at ordinary temperatures will not injure the fruit if rinsing is adequate. From the results it seems that rinsing may not have been sufficiently thorough in the washing machine at Bathurst Farm. Another point of importance is that much of the injury observed in the acid-washed fruit was dark in colour, occurring around the calyx only, and was like that reported by American workers to be arsenical injury due to accumulation of soluble arsenic in the acid bath. In this connection the following descriptions of injuries taken from the U.S.D.A. Miscellaneous Publication No. 168, 1933: "Market Diseases of Apples, Pears and Quinces," are interesting.

"*Acid Injury*, pale, sunken spots, often brown at the edges usually around lenticels, and mostly at the stem and calyx ends of the apple.

"*Arsenical Injury*, greyish to brown or black irregular areas, usually around the calyx and sometimes in the stem cavity.

"*Alkali Injury*, generally dark, often black areas around the calyx and sometimes irregular sunken, rather pale areas elsewhere."

The presence of soluble arsenic will darken the otherwise pale acid injuries, and is often responsible for the dark colour of alkali injuries. The dark colour of many of the injuries suggests that soluble arsenic did accumulate in the acid bath in the tests at Bathurst. Fisher and Reeves[1] describe acid injury as being rare, soluble arsenic injury common, and alkali injury as occurring occasionally in the commercial washing of apples in America. Also hot water alone will injure apples, and a temperature of 100 deg. Fahr. for one minute is stated to be about the upper limit of safety; heat injury results in cracking of the skin, usually around the calyx and greyish to light brown areas may develop if the injury is more severe. The necessity for thorough rinsing in order to avoid injury is stressed in all reports of work dealing with apple washing injuries. If the rinse water is poorly available it is recommended in America that lime be added to it. This treatment will reduce injury as the acid is neutralised and the arsenic rendered insoluble.



Typical Acid Wash Injury on Granny Smith Apples, Developed after Removal from Cool Storage.

In the tests carried out at Homebush it was found that ordinary storage wastage was not affected by washing treatments unless wash injury was severe, in which case mould was increased.

Treatments apparently increased senescent scalds in Granny Smiths, but this increase is probably not real, as lateral wash injury often coalesced to a scald-like lesion after removal from cool store. Some core rotting and calyx rotting was caused by treatment, and the former and usually the latter was associated with an open calyx condition which allowed penetration of the acid. Strickland and Cole[2], in Victoria, found also that ordinary storage wastage was not increased by acid washing, which in their tests caused practically no injury, but they found considerable core rotting in Delicious and Five Crown apples. These varieties often have an open calyx, and the rotting was regarded as being due to infection following acid penetration and injury

* NOTE:—If oil has been added to the orchard sprays the apples should be soaked in some alkaline cleansing solution before washing in acid. An 8 per cent. solution of sodium silicate proved satisfactory, but more dilute solutions of other alkaline detergents may prove to be more effective; meta silicates should be tried. Further experiments along these lines seem to be necessary. It is considered very desirable that the fruit should be rinsed with water after the alkaline bath and before acid washing.

[1] Arsenical and other Injuries of Apples Resulting from Washing Operations. U.S.D.A., Tech. Bull. 245, 1931.

[2] Apple Washing Trials—Tests in 1934 and 1935. *J. Vict. D. of A.* Vol. 34, 1936. pp 542-552.

to the core. They also found that core rotting was considerably increased if the depth of submersion of the apples in the bath was increased, or if the strength of the acid was increased from 1 to 3 per cent.

In the tests at Homebush with Jonathans, in 1939, there was little injury and no calyx rots developed in fruit which was only sprayed with acid.

From the tests carried out it is apparent that as the temperature of the bath is increased the liability to injury increases also, and at temperatures greater than 100 deg. Fahr. injury may be severe: this was particularly apparent with Delicious apples which often have an open calyx. From the point of view of injury, the bath temperature was more important than the strength of the acid, although injury was sometimes increased by increasing the concentration of acid from 1 to 1½ per cent. The greater injury in Jonathans in 1940 with both strengths of acid at 70-80 deg. Fahr. than at 80-90 deg. and 100-110 deg. is difficult to explain, but may have been due to some differences in rinsing. Injury was apparently not affected by wrapping and packing the fruit wet instead of drying it after washing.

Considerable injury occurred in all varieties, but there was more lateral and stem injury in Granny Smith apples than in the Jonathans and Delicious, in which varieties injury was practically confined to the calyx. On the other hand core rotting did not occur in Granny Smiths which have a closed calyx. In Granny Smiths injury was first developed at the calyx, and as the bath temperature was raised, stem and lateral injury appeared and the severity of the injury increased.

(*Concluded.*)

Meat Production, 1945.

The following table shows recorded meat production in New South Wales for 1945 in relation to the production targets set:

	Slaughterings.	Production.	Production Target.
	Nos.	tons.	tons.
Beef ...	584,210	113,959	....
Veal ...	400,485	12,928	....
Beef and Veal ...	984,695	126,887	150,000
Mutton ...	4,859,081	84,789	....
Lamb ...	3,017,734	43,025	....
Mutton and Lamb ...	7,876,815	127,814	155,000
Pork ...	138,532	9,037	....
Bacon and Ham ...	364,617	18,132	....
Pigmeats ...	503,149	27,169	37,000
Total, All meat ...	9,364,659	281,870	342,000

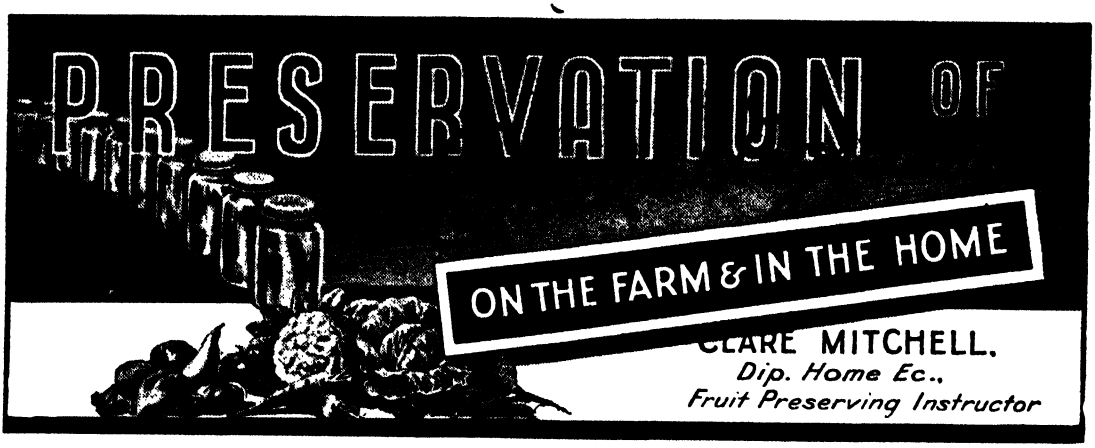
DIVISION OF MARKETING AND AGRICULTURAL ECONOMICS.

ALMOST all broom millet producing areas of the State put in increased acreage this year, and are giving considerably better yields than for the past few years. Total production has been officially forecast at approximately 21,700 cwt. Crops of up to 10 and 15 cwt. per acre are quite common.

The Australian Women's Land Army—*continued from page* 301.

there closed a chapter in the lives of the many hundreds of girls on which they can reflect with pride as a period of honest endeavour which helped materially in the war effort and will not soon be forgotten by the many growers to whom they rendered assistance in the hour of need.

When one reflects on all the facts of the case, including the very potent one that this, almost alone of all the Women's Services during the war, could not be classed by any stretch of imagination as a "glamour job"—then the least one can say is "Well done—Australian Women's Land Army Girls."



CITRUS MARMALADES.

THE citrus fruits are commonly used to make marmalade. The bitter orange, usually called Seville, is the most popular for this purpose, but sweet oranges may be used in combination with lemons, grapefruit or Seville oranges to make excellent varieties of marmalade.

When making marmalade, the peel of the fruit is the most important part, and because of its thickness, long cooking is required. In this respect marmalade differs from most jams. More water is also required; the peel is placed in a large quantity of water and boiling has to be continued for at least two hours—sometimes longer.

Care must be taken to avoid long cooking after the sugar is added, as this not only darkens the colour and spoils the flavour, but affects the pectin and so spoils the jelling properties.

Pectin or Jell.

The pectin or jell of citrus fruits occurs mainly in the white pith and the seeds—not in the skin or juice. Some people cut a good deal of this white pith away, which reduces the jelling property of the marmalade. If the housewife prefers marmalade without the pith, it can be cut up roughly and tied with the seeds in a little muslin bag and removed just before the sugar is added. In this way the pectin can be extracted and no value lost.

Factors Affecting Jell or Set.

The setting of jams and marmalade depends on the amount of pectin present, the acid and sugar. Sometimes even with Seville oranges the amount of acid is relatively low, and a little lemon juice or tartaric acid is added.

Some General Rules.

Wash the fruit well—scrub with a brush if the skins are at all dirty. The peel may be removed from the fruit very easily by covering it with boiling water for a few minutes. Unless marmalade is made with whole rings of fruit, it is easier to cut the skin up finely after the fruit is peeled. The finer the peel and pith are cut the more readily is pectin released.

Soaking the peel in water overnight helps to soften it—and is desirable, but not essential. Longer cooking will bring about the same result. Some recipes provide for leaving the cooked pulp for twenty-four hours before adding the sugar. This is quite unnecessary and is wasteful of fuel, but if it is convenient for any reason, it will not cause any harm.

Cooking.—Approximately two to three hours cooking of the pulp will cause the peel to soften and reduce the bulk satisfactorily. If the pulp is reduced before adding the sugar, fifteen to twenty minutes cooking with the sugar will give marmalade of good set and colour.

Filling into Jars.—The marmalade should be allowed to cool slightly before pouring into the jars, to prevent the peel from rising to the top.

Cool in the preserving pan until a thin film forms, then stir and pour into hot, clean jars.

Cover with waxed paper or wax when hot and seal the lids when cold.

Seville Orange Marmalade.

Materials.—

3 lb. Seville oranges.
6 pints Water.
6 lb. Sugar
¼ oz. Citric or tartaric acid.
Juice of 2 lemons.

Method.—

(1) Wash the oranges.

(2) Scald the oranges, remove the skins and cut them into shreds.

(3) Cover the shredded peel with half the water, and leave overnight if possible.

(4) Cut up the rest of the fruit roughly, add to it the lemon juice and acid and cover it with the remainder of the water.

(5) Next day cook the two lots separately for 1½ to 2 hours.

(6) Strain the pulp to remove seeds and coarse pith, and add it to the cooked peel.

(7) Add the sugar and cook until it is all dissolved Bring to the boil and cook quickly until it jells—about 15 to 20 minutes. Remove the scum.

(8) Cool slightly before filling the hot jars.

Marmalade.

Materials.—

6 Seville oranges.
6 Lemons.
12 lb. Sugar.
5 quarts Water.

Method.—

(1) Peel lemons thinly and shred rind very finely.

(2) Cover lemon rind with 4 oz. salt to 1 pint water, and leave overnight.

(3) Remove white pith and seeds from lemon pulp and cut up finely.

(4) Cut Sevilles into fine slices.

(5) Place Sevilles and lemon pulp in preserving pan and cover with the 5 quarts water; leave overnight.

(6) Next day pour salt water off lemon rind and add to the other ingredients.

(7) Boil all together for about 1½ to 2 hours, without sugar.

(8) Add sugar and stir until dissolved. Boil for about 20 minutes, until set. This appears thin, but will soon jell.

(9) Bottle while hot. Seal when cold.

Lemon Jam.

Materials.—

1 lb. Sliced lemons.
3 lb. Sugar.
3 pints Hot water.

Method.—

(1) Pour hot water over the sliced fruit and allow to stand for 48 hours.

(2) Take out 2 cups of water and replace with 3 cups fresh water (this removes bitterness).

(3) Boil about 1 hour with lid on, or until tender.

(4) Add sugar and boil steadily until it jellies when tested.

(5) Bottle hot. Seal and label when cold.

Orange Jam.

Materials.—

3 Large navel oranges.
3 pints Water.
3 lb. Sugar.

Method.—

(1) Wash fruit and cut into very thin slices.

(2) Add boiling water and allow to soak overnight.

(3) Boil gently for 1½ hours with lid on pan.

(4) Add warmed sugar and cook until it jells when tested.

(5) Pour into heated jars. Seal when cold.

As the result of strong representations made by the New South Wales Minister for Agriculture (Hon. E. H. Graham) to the Minister for the Army, arrangements were made recently for the military authorities to vacate the large section of the grower-sellers vegetable market which they had occupied during the war years.

Weevils Associated with the Bud-fall of *Eucalyptus sideroxylon*.

E. H. ZECK, Entomologist.

REPORTS have been received during the present season of a serious dropping of the buds of one of the ironbarks, *Eucalyptus sideroxylon*, popularly known as "Mugga," and Black or Red Ironbark. This falling of the buds occurred in the western districts, particularly in the Mudgee and Gilgandra areas, and has deprived apiarists of acres of valuable honey-producing flowers.

There seems to be little doubt that this bud-fall, in the Mudgee areas, at least, was caused by a small weevil which punctured the unopened flower buds near their bases.

Mr. R. H. Taylor of Mudgee, from whom specimens of the weevils were received, stated in a communication which appeared in the *Australasian Beekeeper*, 15th April, 1946. "Some years ago I noticed patches of this timber affected, but they were comparatively small patches. Three years ago, when there was a good flow from this class of timber near Dubbo, my particular country was affected and completely spoiled, with not a bud remaining on the trees. Now, after three years, this same timber was budded well some time ago, but last week when I visited it, I found the same thing had happened again—all the buds were on the ground." Mr. Taylor, who also made some observations on weevils supplied with fresh buds and leaves, saw them drilling holes in the buds, and he stated:—"The most unique thing I discovered was that they lay an egg in each hole they drill."

The habit of first making an egg-cavity with the slender proboscis before depositing an egg is common to many weevils, including the grain weevils (*Calandra oryzae* and *C. granaria*), and the elephant beetle (*Orthorrhinus cylindrirostris*) which attacks various fruit trees and other trees.

Mr. N. B. Meek of Gilgandra, who submitted specimens of weevils from his district, stated in a communication dated April 13: "There are hundreds of thousands of acres of mugga ironbarks that were well-budded three months ago, and today have all their buds on the ground, and every one of these shows a puncture near the base. The weevils did not show a preference for muggas, as such, but for the most advanced buds in the territory I examined."

Mr. Meek said they were also attacking the various forms of mallee gums, from the Harvey Ranges to Coonabarabran, but he saw no evidence that other than the buds were being injured.

As specimens of these weevils were not represented in the Departmental collections, they were compared with named examples in the Australian Museum by Mr. K. C. McKeown, Assistant Entomologist at that Institution, and the small species from Mudgee is considered to be *Haplonyx longipilosus* Lea, and the larger weevils from Gilgandra to be *Haplonyx spencei* Gyll., and *Oxyops gemella* Pasc.

H. longipilosus, which measures slightly more than ⅛ inch in length (excluding the rostrum or snout), is brownish-red in colour, the whole body being covered with light-yellowish scales. It was originally described by Lea in 1897 ([1]), the habitat given being Swan River.

In writing of the genus *Haplonyx*, Lea states:—"The larvae of the species of this genus, at least such as are known to me, live within the woody galls and excrescences formed by various species of Brachyscelids

[1] *Proc. Linn. Soc. N.S.W.*, Vol. XXII, p. 634, 1897.

Adult of *Haplonyx longipilosus*.
Upper Left.—Buds of *Eucalpytus sideroxylon*. (Actual size) showing weevil-punctures.
Lower Left.—Weevil, actual size.

and Hymenoptera, though one species at least (*H. vicina* Chev.) is a true gallmaker, and in the larval state lives in companies around a moderately large Eucalyptus twig high up on tall trees. One such gall seen by me must have contained at least forty larvae, a number of which were successfully reared."

Another weevil of this genus, *H. albosparsus* Lea, has been recorded by Morgan[2] as developing in flower bud galls caused by Agromyzid flies on the Spotted Gum (*Eucalyptus maculata*).

Although some members of the genus *Haplonyx* may be gall inhabitants or gall formers, there is one species, *H. tibialis* Lea, which attacks the flower buds of the Tuart (*Eucalyptus gomphocephala*), a useful hardwood in West Australia, and also, to a lesser degree, the flower buds of the West Australian Flowering gum (*E. ficifolia*).

The life-history of this weevil, which was studied by Newman and Clark in 1924 ([3]), briefly, is as follows:—The female weevil drills a hole in the capsule of the flower bud, deposits a single egg in the hole and then fills the hole with some chewed out material. The bud is then cut off, or an egg may be laid in each flower bud on the stalk before it is cut off. In some instances the hole may be bored and no egg deposited, the cluster then being cut off or ringbarked, or the twigs bearing flower buds may be cut off without being bored. For the development of the larvae within the buds it would seem to be necessary that the buds fall to the ground and soften.

The length of the life-cycle of the Tuart bud weevil is stated to be as follows:—Egg stage 8 to 12 days; the larval or grub stage about 4 months; the pupal or chrysalis stage about 1 month. The brownish-coloured adults, which measure about ¼ inch in length, cut their way out of the buds.

[2] *Agric. Gaz. N.S.W.*, Vol. XLIV, p. 126, 1933.
[3] *Journ. Agr. W.A.*, Vol. I (2nd Ser.), pp. 357–360, 1924.

The following descriptions apply to the weevils from Gilgandra:—

Haplonyx spencei, which measures about 5/16 inch in length, is a dark-brown, robust form of weevil, and its body is covered with small, yellowish and reddish scales, which in parts form small tufts. There is a narrow, yellowish transverse band of scales near the end of the wing-covers.

Oxyops? gemella, which measures about ¼ inch in length, is a more slender weevil. It is dark-brown in colour, and its body is covered with small yellowish and brown scales.

In both *H. longipilosus* and *H. spencei* the rostrum or snout is slender and about equal in length to half that of the body measurement, but in the *Oxyops* it is quite short and broad.

Nothing appears to be known of the habits of either *H. spencei* or the species of *Oxyops*, but on account of the dimensions of these two weevils, it is considered that the flower buds of the mugga would not be sufficiently large to permit of the development of either insect within them. *H. longipilosus*, however, on account of its small size, would have ample space for development.

There is not, at present, any practical method of controlling native insects of this type, which, in some seasons, may occur in plague numbers over extensive tracts of country.

Newman and Clark in their paper suggested, in order to make up the loss of Tuart seed caused in some years by *H. tibialis*, in West Australia, that when an abnormal crop of flower buds, in excess of weevil requirements is produced every few years, every effort should be made to collect as much seed as possible.

Agricultural Education—Group Instruction in Rural Areas.

VARIOUS schools of instruction are to be held at Hawkesbury Agricultural College during the July winter vacation. They will include courses for Junior Farmers, for pig raisers and for youth leadership training. The last mentioned will follow the Annual State Conference of the Agricultural Bureau.

Commenting on this development in rural education the Minister for Agriculture, Mr. Graham, said that it was his intention, as soon as possible, to decentralise these instructional schools by holding them at various Experiment Farms. In that way a greater number of country people would be given increased opportunities for agricultural education.

Youth Leadership Training Schools had already been promoted with success by his Department in various country centres, said Mr. Graham. That at Trangie Experimental Farm, held at the end of April, was attended by 35 young men and women.

INSECT PESTS.

Notes contributed by the Entomological branch

Codling Moth (*Cydia pomonella*).

GROWERS are reminded of the importance of reducing the winter carry-over of codling grubs to a minimum, as the extent to which this is done has an important bearing on the number of moths that will emerge in the first spring brood.

Destruction of Over-wintering Grubs.

The destruction of over-wintering grubs on the trees may well be combined with pruning and should be a routine treatment. The trunks of the trees should be scraped free of loose bark, and the cracks and crevices examined for sheltering grubs. Broken branches should be removed, and finally all likely cocooning places for the following season's grubs should be filled in with putty or some similar mixture. All larvae and pupae, and all litter scraped from the trees should be burnt. The soil next to the trunks of the trees should also be removed for a depth of about 2 inches as numbers of the larvae enter the soil to spin their cocoons on the trunks below soil level. This is particularly noticeable where smooth-barked trees are growing on light soils.

Removal of Bands.

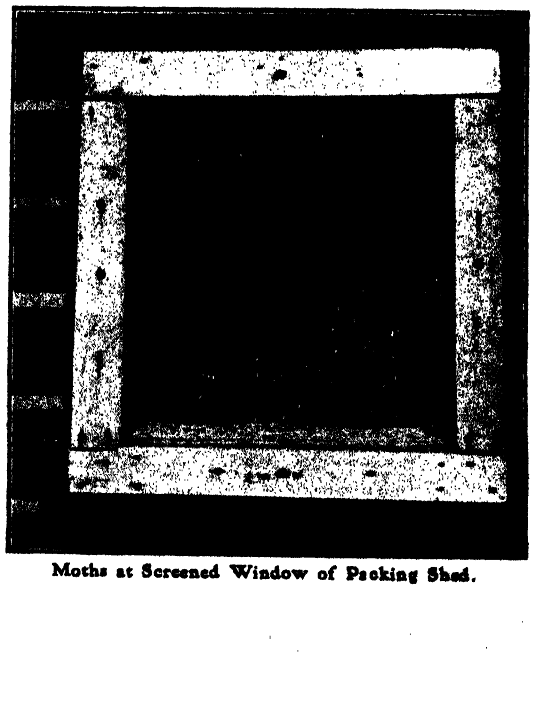
Two kinds of bandages are in common use—the chemically-treated bands and the sacking bandages. Bandaging, although not compulsory in all districts, is a valuable supplementary control measure.

The bandages are placed around the trunk and around every limb which arises less than 5 inches from the ground, and should not be allowed to touch the ground. The bandages should be kept in position from 15th November until at least 1st June of the following year, and are to be removed not later than 31st July.

The chemically-treated bands require no attention until the time of their removal, when they should be burnt. These bands should be removed carefully, as numbers of the grubs will be found against the tree and may fall to the ground. Live grubs will be found in these bands in June or July, as the bands lose much of their toxicity after long exposure. The killing of grubs or prevention of moth emergence until the end of February is all that is expected of this type of band.

Chemical bands are most conveniently disposed of by burning in a tin burner, suitably made to carry from tree to tree. The oil-soaked bands burn readily and all grubs and litter are destroyed immediately.

Where the sacking bandages are used they must be undone and examined every fortnight until 21st February, and all sheltering larvae or pupae in cocoons found within removed and destroyed, the bandages then being replaced. After the end of Feb-

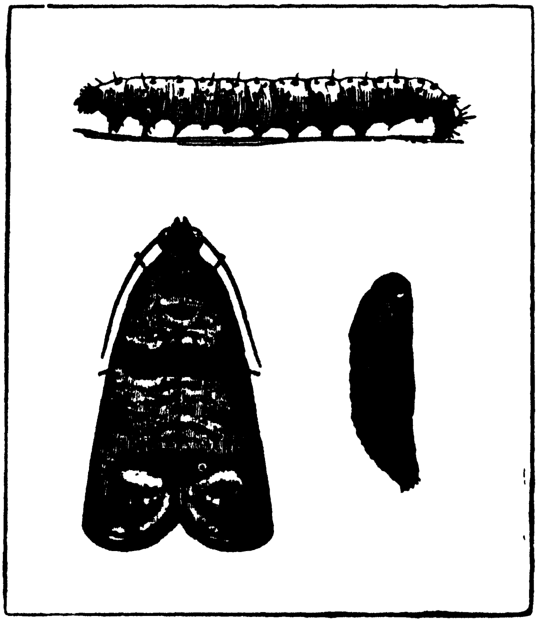


Moths at Screened Window of Packing Shed.

ruary they may be kept in place until removed in June or July.

Treatment of Old Cases.

During harvesting a large quantity of infested fruit may be picked into store boxes, and as the grubs over-winter readily in such boxes, some treatment will be necessary to check this source of carry-over. Dipping the boxes in boiling water for a



Larva, Pupa and Adult of Codling Moth.

period of 3 minutes has been found quite satisfactory. Where the packing shed has been made moth-proof, the boxes may be stored without treatment. Where second-hand cases are used, dipping in boiling water for 3 minutes is an important precaution against reinfestation of the orchard.

Packing Sheds.

The woodwork of graders, benches, etc., should be carefully examined and all grubs destroyed.

Codling moths tend to collect about windows in their efforts to leave the packing shed, and a check can easily be made on the emergence in the shed by periodical examinations. Emergence in the shed is somewhat later than in the orchard, the maximum emergence of spring-brood moths from this source occurring about the end of November. The moths may be destroyed at the windows or may be caught in shallow pans containing a mixture of molasses (1 fluid ounce) and water (9 fluid ounces).

Waste Fruit Pits.

In some districts the use of insect-proof waste fruit pits is compulsory for the destruction of infested fruit, but their use can be recommended in all orchards, on account of their convenience and effectiveness. A pit 6 feet by 5 feet, with a depth of 6 feet, when filled, will hold approximately 144 bushels of waste fruit. Where waste fruit pits are not used, all fallen and infested fruit must be destroyed either by immersing in boiling water for 10 minutes, or by burning thoroughly.

D.D.T.

Sprays containing various concentrations of D.D.T. have been tested for the control of over-wintering codling moth larvae, and it has been found that this chemical appears to be too ineffective against hibernating larvae to be of any real value.

The Vegetable Weevil (*Listroderes obliquus*).

GROWERS are warned that practically all winter vegetables may be attacked at this period of the year by the larvae or grubs of the vegetable weevil.

The small, stout-bodied grubs, which measure about ½ inch in length when fully-fed, are legless, and vary in colour from light-green to yellow. They usually make their appearance about three or four weeks after the first autumn rains, and are to be found on the undersurfaces of the leaves or on the crowns of the plants.

Large, irregular holes may be eaten in the leaves, and the new leaf growth of the crowns may be eaten away as it develops. Plants such as carrots, beetroot, turnips, etc., may be attacked below the ground.

The larva becomes fully-fed in from four to six weeks, and it then enters the soil, where it constructs a cell within which it enters its pupal or chrysalis stage. The grey-brown adults emerge from the soil about the end of August and are most numerous during October and November.

Both larvae and adults hide in the soil by day and feed at night, but the larvae may also feed during the day.

Control.

Clean cultivation is an important factor in vegetable weevil control, but it must be remembered that the destruction of weeds late in the season will cause the weevils to migrate from the dying weeds or from the soil, into cultivated areas.

As a precautionary measure, before planting out, particularly where weed growth or crop remnants have been removed or where the ground is suspected of being infested, the area, after an interval of several days, should be baited before planting out. For this purpose chopped leaves of lettuce, turnip, Cape weed or marsh mallow, etc., which have either been sprayed or dusted with lead arsenate, may be scattered over the ground late in the afternoon.

If bran is available, a poison bait, prepared according to the following formula, may be broadcast over the area or partly worked into the soil, late in the afternoon.

The bait consists of:—

Bran	24 lb.
Paris green	1 lb.
Salt	8 oz.
Water	2½ gallons.

To prepare the bait, the bran and Paris green should be thoroughly mixed first, and then made into a crumbly mash with the water in which the salt has been dissolved.

If the crops are already infested, the bait may be distributed lightly along the rows or broadcast throughout the area.

With crops such as carrots, potatoes, etc., the leaves of which are not used as food, control may be obtained either by spraying

Larva or Grub of the Vegetable Weevil.

or dusting with lead arsenate. The formula for the spray is:—

Lead arsenate powder	4 oz.
Water	5 gallons.

The dust consists of a mixture of:—

Lead arsenate powder	4 oz.
Kaolin	1 lb.

Where infestation occurs amongst crops such as lettuce, spinach, etc., *which must not be contaminated with lead arsenate*, chopped poisoned-foliage bait or poison bran bait may be scattered along the rows of plants.

Red-legged Earth Mites (*Acarina*).

RED-LEGGED earth mites are mainly winter pests, and the damage they cause to plants usually becomes apparent during June, and continues until September.

Two species of these earth mites occur as pests in New South Wales. The most prevalent and widespread species, *Penthaleus major,* occurs over a large portion of the State, although the districts which appear to be most favourable for its development are the Upper Hunter and North-west Slopes.

The other closely allied species, *Halotydeus destructor,* is confined to the southern sections of the State.

The mites, by feeding on the plants, cause blemishes on the leaves, which typically appear as silvery or greyish areas, usually along the main veins. When the plants are heavily infested the whole leaf surface may be damaged and present a bleached appearance. Seedlings, particularly of lucerne, may be killed outright, and this injury is often mistaken for frost damage. Late-sown crops which germinate and commence growth under conditions which are too cold to allow them to outgrow the mite injury, suffer the most damage.

The preferred cultivated host plants are lettuce, peas, lucerne and Subterranean clover. Turnips, rape, spinach, silver beet, beetroot, etc., and various ornamental flowers such as chrysanthemum, calendula, snapdragon and stock are also attacked. The pasture weeds most frequently attacked are Shepherd's Purse (*Capsella bursa-pastoris*),

D. D. T.

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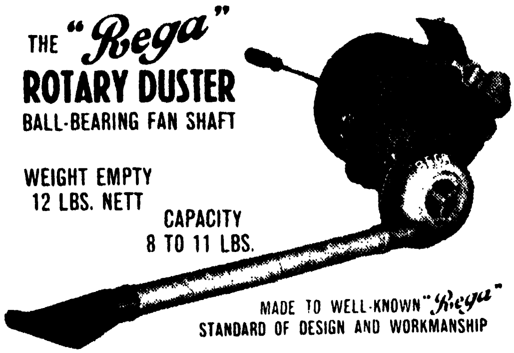

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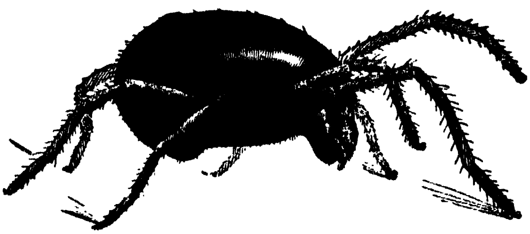
variegated thistle (*Silybum marianum*), prickly lettuce (*Lactuca scareola*) and nettle weed (*Lamium amplexicaule*).

The adult of *P. major*, which measures about 1/25 inch in length, has a purplish-blue body, and on its upper surface there is an oval reddish patch. The legs and mouth parts are bright red.



Red-legged Mite (*P. major*).

The eggs are laid singly on the leaves, on the soil, or amongst rubbish, etc. They are wrinkled and vary in colour from salmon to whitish-yellow, and hatch with the beginning of cold weather, but only under suitable moisture conditions.

During the day numbers of mites may be found clustering together in the centres of the infested plants, or on the surface of the soil under the plants. The majority of the mites feed during the early morning or towards sunset.

The other species of earth mite, *H. destructor,* which is much more active, has a velvety-black body and red legs, and does not possess the reddish patch on its back. It lays its eggs in masses, in a single layer, mainly on the undersides of the leaves of the food-plant, and mostly where these come into contact with or close to the soil. The surface of the egg is smooth and shiny when moist, bright yellow or orange in colour and may have a whitish bloom when dry.

These mites are to be found in groups when feeding.

Control.

Where vegetable and flower crops are attacked, these mites may be controlled with a white oil and nicotine spray diluted in the following proportions:—

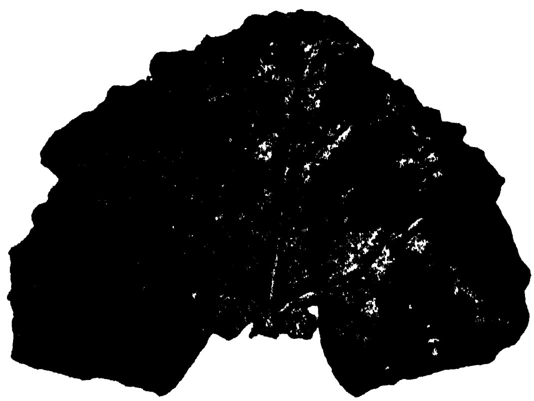
White oil emulsion ..	6 fluid oz.
Nicotine sulphate .	1½ fluid oz.
Water	5 gallons.

A dust which has also been found effective in controlling these mites consists of a mixture of:—

Nicotine dust (2½ per cent.) ..	1 lb.
Tobacco dust (superfine) ..	1 lb.

Treatments with sprays or dusts containing nicotine should be carried out during the warmest period of the day, and a reasonably warm, fine day should be selected for the operation. It is essential to spray or dust the soil below the plants as well as the plants themselves.

In experiments conducted for the control of one of the red-legged earth mites, *H. destructor,** a poison bait containing sodium arsenate was found to be extremely toxic, and this bait should prove very useful for the treatment of infested gardens. Its use on most pastures, however, would be too expensive.



Leaf Showing Characteristic Damage Caused by Red-Legged Mites.

[*After Swan.*

The proportions of the bait used were 9 : 6 : 2 : 1/5, the materials and the equivalent amounts being as follows:—

Chaff (as a carrier) ..	2 lb. 3 oz.
Water	1½ pints.
Sugar	10 oz.
Sodium arsenate ..	1 oz.

Where honey and treacle were used as substitutes for the sugar, the baits appeared to have very little, if any, attraction for the mites.

The bait is broadcast over the infested area at the rate of 1 lb. to approximately 200 square yards.

* Norris, K. R., 1943. Coun. Sci. Ind. Res. Bull. 171, pp. 1-28.

Under field conditions an excellent kill of these mites has been obtained with a dust consisting of:—

Carbolic powder	1 lb.
Hydrated lime	4 lb.

This dust is recommended and may be of special value for the treatment of infested ground before sowing a crop. The most effective time for treatment would be two or three weeks after the beginning of the autumn rains.

The Cineraria Leaf-miner (*Phytomza atricornis*).

DURING the late winter and early spring, in most years, the leaf-mining larvae of this fly cause damage to cinerarias in the Sydney district. Where the infestation is light the blemishes on the leaves cause them to become unsightly, but where the plants are heavily infested their growth may be severely retarded or they may be killed, as most of the leaves are completely destroyed.

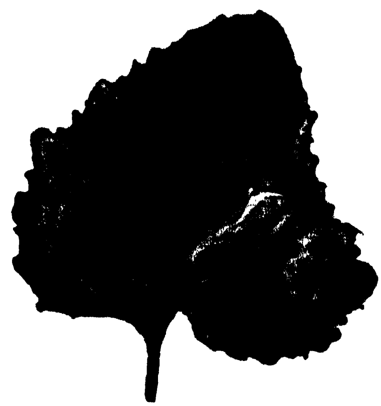
This fly also develops freely in the leaves of other related plants such as sow thistle (*Sonchus oleraceus*), dandelion (*Taraxicum officinale*), Cape weed (*Cryptostemma calendulaceum*), prickly lettuce (*Lactuca scareola*), etc.

The adult, which measures about ⅛ inch in length, is a small, grey fly, which during the winter and spring months may be seen walking over the leaves of the plants.

The eggs are laid within the leaf tissues, the puncture marks or "stings" being seen as small scars. The eggs hatch in about four or five days, and the very small larvae or maggots commence to tunnel through, and feed upon, the leaf cells between the upper and lower epidermal layers. The tunnels or mines at first appear as pale, narrow, thread-like lines, but as the maggots grow, the tunnels become more conspicuous and eventually they may be $\frac{1}{16}$ inch in width.

The maggot grows by a series of moults, until, when fully-fed, it may measure about 3/16 inch in length. At this stage the larval skin hardens to form an elongate, barrel-shaped puparium within which it enters its pupal or chrysalis stage. The puparium, which measures about 1/10 inch in length, is light brown in colour and is readily seen beneath the cuticle on the lower surface of the leaf. Numbers of puparia may be found on an individual leaf. After about ten days the adult fly emerges and makes its way out of the leaf.

The length of the life-cycle, from egg to adult, in the Sydney district is about 3½ weeks in August and 3 weeks in September.



Typical of the Damage Caused by the Cineraria Leaf Miner.

Control.

This pest may be controlled by spraying with a nicotine sulphate and soap solution at the following concentration:—

Nicotine sulphate ..	1 fluid oz.
Soap	2 oz.
Water	2½ gallons.

Spraying should be commenced when the first mines appear in the leaves, and should be repeated at intervals of ten days. Particular care should be taken to ensure that both sides of the leaves are thoroughly wetted with the spray.

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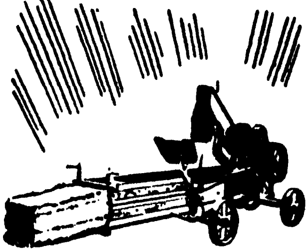

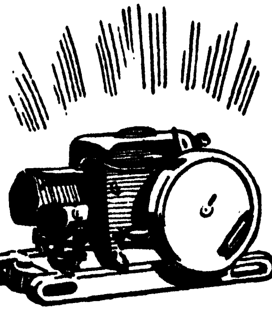

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PLANT DISEASES

DIEBACK AND GUMMOSIS OF STONE FRUIT TREES.

F. L. MILTHORPE, B.Sc.Agr., Plant Pathologist.

A KEY to the diagnosis of the causes of dieback of stone fruit trees is given, together with a brief description of the symptoms and control of these disorders. The key should serve as a useful guide, but must be regarded as tentative until present investigations have been completed.

As an aid to orchardists, definitions of certain of the words included in this article are given hereunder:—

Gummosis.—Exudations of gum.

Canker.—A dead area on a stem, surrounded by living tissue.

Frass.—The deposits of wood-chewing insects.

Rhizomorph.—An aggregation of fungal tissue into a structure resembling a piece of blackened string.

Gall.—An outgrowth from the surface of the plant which forms a structure resembling a wart: galls may be quite large.

KEY TO MAIN DISORDERS.

The following key is based on the most readily visible symptoms. Before arriving at a diagnosis, the fuller descriptions should be studied for confirmatory symptoms. Gummosis, for example, is not always a constant characteristic and may occur whenever plant tissue is wounded. However, the symptoms described are those most usually found with each disease.

I. Gummosis usually present—
- A. Gummosis occurring in late winter and spring—
  - 1. Pea-sized gum exudations occurring over entire tree .. San Jose Scale.
  - 2. Large amounts of gum exuded from localised areas; canker present .... Bacterial Canker.
- B. Gummosis occurring throughout year—
  - 1. Gumming on limbs—
    - (*a*) Localized areas of gum; no canker, but frass present .... Tree Borers.
    - (*b*) Canker along upper surface of limb, gummosis at margins ... Limb Dieback of Old Trees.
  - 2. Gumming on crown, extending to trunks—
    - (*a*) Rhizomorphs present on roots ....Armillaria Root Rot.
    - (*b*) Rhizomorphs not present—
      - (i) Yellowing of leaves, lateral dieback and root decay precedes canker and gummosis .... Waterlogging.
      - (ii) Canker extending from crown upwards, tree collapses suddenly without previous yellowing ... Peach Trunk Canker.

II. Gummosis usually absent—
- A. Death of large limbs or whole tree—
  - 1. Canker below dying portion; leaves narrow and pale ...... Bacterial Canker.
  - 2. Canker commencing from top of limbs—
    - (*a*) Cankered portion uniformly dry ...... Fruit Tree Root Weevil.
    - (*b*) Cankered portion hard, dry and cracked .... Wood-Rotting Organisms.
  - 3. No canker present; gall on crown .... Crown Gall.
- B. Death of laterals or terminal leaders only—
  - 1. Chlorosis of leaves present—
    - (*a*) Chlorosis shows mosaic pattern or uniformly pale; leaves small and rosetted .. Zinc Deficiency.
    - (*b*) Chlorosis marginal and between secondary veins .. Manganese Deficiency.
  - 2. Leaves of normal green colour ...... Environmental Complex.

MAIN SYMPTOMS AND CONTROL OF DISORDERS.

Bacterial Canker.

Two types of limb infection are found:—(i) the gummosis canker (always found on apricot and cherry) which shows copious exudation of gum surrounded by dying bark; and (ii) the sour-sap canker (often found on peach, nectarine and plum), involving a moist brown condition of the bark. Both cankers appear in winter and early spring and stop extending when host activity recommences. The limbs may not collapse until summer. Leaf-spotting, bud and blossom-blighting and fruit infection may also occur. The disease may be controlled by pruning in early autumn and spraying with Bordeaux mixture (15-15-100) in early May, mid-June and late July.

Fig. 1.—Gummosis Canker, caused by the Bacterial Canker Organism, on Apricot.

San Jose Scale.*

Small lumps of gum varying in size from that of a pinhead to that of a marble are often found over the entire portions of badly-affected peach trees. The underlying bark is dead in irregular areas. The surface of the area has a greyish, scurfy appearance.

The scale can be controlled by spraying with dinitro-ortho-cresol oil (1-40) or miscible red oil (1-20) during the dormant period or with lime sulphur (1-10) at bud swell. (See Insect Pests Leaflet No. 27.)

Tree Borers.*

Trees affected with borers show a large exudation of gum and frass covering the opening of the tunnel.

To control, remove frass to expose the tunnel opening, and then insert a piece of pliable wire and twist to kill the caterpillar. The tunnel should then be plugged with grafting wax or other suitable substance to prevent decay and the entry of other secondary insects which may cause further damage. The exposed wood surface should then be painted over. (See Insect Pests Leaflet No. 40).

Limb Dieback of Old Trees.

Many peach, cherry and other stone fruit trees on reaching the age of fifteen to twenty years show dieback of the main limbs.

Fig. 2.—Young Plum Tree Infected by the Bacterial Canker Organism, showing Sour-sap Canker, and Resulting Thin, Narrow, Yellow Foliage.

* These sections were contributed by Mr. S. L. Allman, Senior Entomologist.

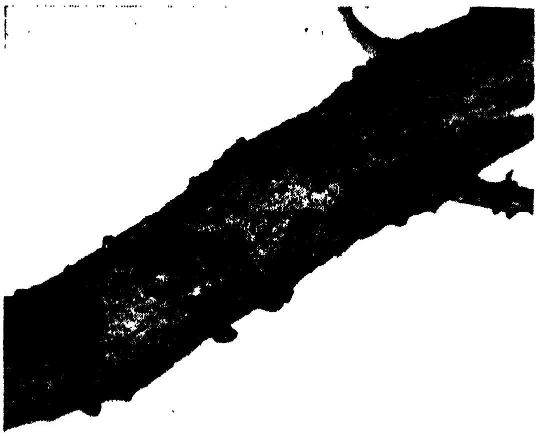

Fig. 3.—Gumming Due to San Jose Scale.
Showing small lumps of gum distributed over the whole tree.
[Photo by E. J. Wason.

Gummosis and sour-sap cankers are found involving the whole of a limb and are usually on the upper surface. The bark of affected areas is hard, dry and sunken. The cause of this condition is unknown.

Armillaria Root Rot.

The leaves have a yellow appearance, resulting from rotting of the crown and roots. Bootlace-like strands occur on the surface of the bark. In advanced stages gumming from around the crown and a canker moving up the trunk may be found.

All diseased portions should be removed from the butts and main roots and the cut surfaces treated with Bordeaux paint. Care should be taken to see that the land is well-drained, the trees well manured and properly attended, and that all stumps and roots of trees are removed before an orchard is planted. (See Plant Disease Leaflet No. 18.)

Waterlogging.

Trees affected by periodic waterlogging show a premature yellowing of the lower leaves and a dieback of the lower laterals. A canker accompanied by gumming occurs in advanced stages. Decay of the main roots is evident.

This trouble can only be overcome by adequately draining the soil.

Peach Trunk Canker.

A canker involving both bark and wood commences in the roots and crown. It may be confined to one side of the tree. Extensive gumming from the margins of the canker and from limbs above the canker occur. Trees usually collapse suddenly without premature yellowing or defoliation. The cause of the trouble is unknown.

Wood-rotting Organisms.

Wood-rotting organisms, such as *Schizophyllum commune*, *Polystictus versicolor* and *P. cinnabarinus* may enter through sun-scalded areas, pruning cuts, stumps of limbs which have not been covered by a callus growth of bark tissue. Other dead tissue such as the Dothiorella and Black Rot cankers may also form a point of entry. Once infection has occurred, these organisms attack the heart wood and finally cause the death of the limb. A long bark canker running along the length of the limb is produced, and the bark dries and cracks and eventually peels off.

Care should be taken to see that all infected limbs are removed and burnt, all wounds are trimmed smoothly and covered with Bordeaux paint or a bituminous paint.

Fruit Tree Root Weevil.*

In stone fruits the larvae of the fruit tree root weevil cause a dieback typically affecting one or more limbs of a tree. Symptoms include delayed budburst, a reduction of leaf size and premature discolouration and shedding of leaves, shortening of wood growth, dieback extending downwards from tip of limb, and excessive suckering from the butt in the late stages of decline.

* This section was contributed by Mr. A. H. Friend, Assistant Entomologist.

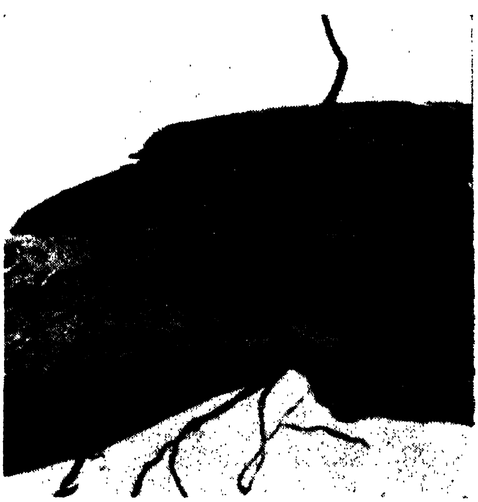

Fig. 4.—Armillaria Rhizomorphs on Root of Apple.

Fig. 5.—Peach Tree showing One-sided Development due to Fruit Tree Root Weevil.

Fig. 6.—Brackets of the Heart Rot Fungus. This wood rotting organism has gained entry through a dead stub or sunscalded area.

The beetle may be controlled by "sticky-banding" the tree trunk in early spring and daily collecting the beetles which congregate below this band.

Crown Gall.

Crown Gall is indicated by a large, uneven gall on the crown or main roots of the tree. If observed before much damage has been done to the tree, it may be cut off and the cut surface painted with Bordeaux paint. Young trees should be examined at the time of planting for Crown Gall and all infected trees discarded. (See Plant Disease Leaflet No. 17.)

Fig. 7.—Small Chlorotic Leaves of Plum Tree. due to Zinc Deficiency.
[Photo by A. E. Vincent.

Little Leaf or Zinc Deficiency.

Dieback of terminal leaders and laterals follows a chlorosis of the leaves. The chlorosis is characterised by the interveinal areas, all veins remaining green. The inter-nodes are shortened and the leaves abnormally small.

Trees should be sprayed with zinc sulphate (50 lb. per 100 gallons water) annually before pruning.

Manganese Deficiency.

Chlorosis due to manganese deficiency is shown by a yellowing of the margins of the young leaves, this yellowing invading the areas between the secondary veins. Die-back of laterals occurs in advanced stages.

The trouble may be remedied by spraying with manganese sulphate (25 lb. per 100 gallons) prior to bud-swell.

Environmental Complex.

A number of different types of disorders occur in which laterals and terminal shoots dieback in the spring. These may be accompanied by abscission of the buds. Gumming is absent. It is suspected that some of these troubles are due to winter temperatures which are too high to "break" the dormancy of the buds, and also to factors which prevent proper bud development during the previous summer. Such factors are drought, high temperatures, and possibly mineral deficiencies. Gumming may occur early in autumn on trees which have been badly droughted and then receive heavy rain or irrigation.

Sudan Grass and Grain Sorghum.

Precautions Against Poisoning of Stock.

THERE appears to be some uncertainty among stockowners concerning the risks involved in the grazing of Sudan grass and the feeding off of grain sorghum crops.

Sudan grass can be extremely poisonous under certain conditions, as it may contain cyanide, and heavy stock losses have been caused, but this should not discourage stockowners from growing and grazing Sudan grass, as its high food value and drought resistance more than outweigh the risk involved. Only cattle and sheep appear to be affected (horses and pigs appear to be relatively resistant to Sudan grass poisoning), and, provided reasonable precautions are taken, risk of losses can be made very small.

The following points should always be observed:—

1. Only well grown stands, say over 18 inches in height, which have suffered no recent check followed by sudden regrowth, should be fed off. Sudden regrowth after a set-back by drought, grazing or being eaten off by grasshoppers is particularly liable to cause poisoning.

2. It is advisable, when a Sudan grass stand is to be grazed, to allow two or three head of stock of low value on to the stand for two or three hours. If poisoning is going to develop, it will usually be noticed within 10 to 15 minutes.

3. Make sure that the stock are not over-hungry when turned on to the stand; losses are most likely with hungry stock.

Some stockowners have reported losses from turning sheep on to grain sorghum crops, even when the grain is fully mature. It is probable that these losses have been due to over-engorgement with grain and not to cyanide poisoning. Of course, where the sorghum crop has some young regrowth there is some chance of cyanide poisoning, but this factor does not appear to have entered into the losses reported. Providing good grazing, or if this is not available, chaff or hay, before turning on to the stand is advisable, as losses are most likely to occur in hungry sheep.

Where sheep are found in trouble from over-engorgement with grain, drenching with ½ pint of linseed oil and ½ oz. turpentine is advisable.

Where stock are affected with cyanide poisoning from grazing Sudan grass or immature sorghum crops, spectacular recoveries may often be obtained by injecting a mixture of sodium nitrite and sodium thiosulphate. Stockowners might make up a mixture of sodium nitrite 1 oz., sodium thiosulphate 4 oz., and water 1 pint. Sheep affected with cyanide poisoning should be injected with 20 cc. of this solution and cattle with 60 cc.

Radio for Bush Fire Fighters.

Special Purchase Facilities Offered to Shire Councils.

SHIRE Councils are now afforded special facilities to purchase modern radio equipment from the Department of Munitions as part of their bush fire fighting organisation.

In making this announcement, the Chief Secretary, Mr. Baddeley, said that full particulars of the equipment had been conveyed by the Bush Fires Advisory Committee to all Shire Councils and already a number had placed orders. It had been estimated, he said, that, for £60, a Council could obtain valuable equipment which would provide radio communication at a large fire. Some of the Councils which had come in under the scheme had purchased three two-way speech sets (walkie-talkie) which could be used by groups of fire fighters actively engaged on the fire front. A heavier set would be mounted on a lorry near the fire for communication over longer distances with another similar type of set (usually based on the Shire Headquarters). The Army, which was represented on the Committee, had agreed to assist in training operating personnel.

The use of radio communication would assist greatly in improving the efficiency of bush fire brigades, pointed out the Minister. In the past a drawback to the efficient functioning of many brigades had been lack of contact between fire fighting groups.

BEEKEEPING HINTS.

The Principles of—

CONTROL OF DISEASE IN BEES

With Special Reference to Major Diseases in New South Wales.

D. L. MORISON, B.V.Sc., Veterinary Officer.

DISEASE may be considered as any departure from the normal. However, in this article, only those diseases of bees which are due to either viruses, bacteria or protozoa will be considered, since these are the only diseases which are likely to merit organised control measures.

Importance of Correct Diagnosis.

In disease control work each separate disease must first be correctly diagnosed, because on the diagnosis will mainly depend the line of action which is to be taken to minimise or eradicate the disease.

Disease is diagnosed under two main sets of conditions—

(1) *In the Field.*—Here visible symptoms are the guides used in arriving at the determination of the disease concerned.

(2) *In the Laboratory.*—A more detailed examination can be carried out using various laboratory (especially microscopic) aids. In many cases the causal organism can be identified and a certain diagnosis given. This is especially so with Nosema disease of bees, the spores of *Nosema apis* being readily identified on microscopic examination.

Formulating Control Measures.

Points to be considered when formulating control measures to deal with the disease are:—

(1) The nature of the causal agent.

(2) The presence of a natural reservoir.

(3) Disseminating agents.

(4) Climatic, seasonal and regional factors, which tend to determine the geographical distribution of a disease ("endemic areas").

The Nature of the Causal Agent.

The longevity of the causal agent and the course of the disease are of great importance when considering control measures to deal with a disease, for with a long-lived causal agent the possibility of a recrudescence of the disease later on after the initial outbreak has subsided, must be guarded against. Spore-forming bacteria and protozoa present a special problem in this connection, owing to the resistence and longevity of the spore stage.

The anthrax bacillus affecting livestock, etc., is a typical example of an organism which is capable of causing recurring out-

Inspecting a Hive for the Presence of Disease.

breaks of disease in areas where it has occurred before; these areas become known as "endemic" areas. Anthrax-infested carcases are burned in order to prevent further contamination of the area with spores of the disease agent.

Is There a Natural Reservoir of Infection?

The occurrence of a natural reservoir of infection is of importance for it may result in outbreaks of disease in areas which were thought to be clean, and render the eradication of a disease a practical impossibility.

American foul brood-infected colonies of bees in trees might be placed in this category. However, it is considered that the careless and ignorant beekeeper represents a far greater menace than do bee trees in-so-far as A.F.B. is concerned.

Disseminating Agents.

These include any agencies which may spread the disease.

The robbing of infected hives in the apiary is considered to be the chief means by which A.F.B. disease is spread, with second-hand infected hive material playing a secondary role. Of late years, however, a new agency is assuming importance, for it is known that the disease has been carried from one district to another in migrated hives.

Climatic and Seasonal Factors.

These tend to determine the geographical distribution (endemic areas) of a disease.

The following are important in relation to bee diseases:—

American Foul Brood.—This is a disease which appears to be favoured by a cool climate, and in New South Wales has tended to persist on the Southern Coast and Highlands.

Sacbrood.—This disease is fairly widespread although some recent outbreaks on the Northern Tablelands have been rather severe.

The increase in migratory beekeeping may tend to spread disease from areas of localisation unless care is exercised.

TWO IMPORTANT DISEASES CAUSED BY SPORE-FORMING ORGANISMS.

There are two important diseases of bees which are caused by spore-forming organisms:—

(1) American Foul Brood, caused by a bacterium, *Bacillus larvae*.

(2) Nosema disease due to a protozoan, *Nosema apis*.

American Foul Brood.

The spore of *Bacillus larvae* has been proved viable for at least thirteen years, and is probably capable of germinating after even longer periods.

The aim in controlling this disease is to destroy the spores, thus preventing the spread, and the possibility of a recurrence at a later date. It is, therefore, considered best that where only a few hives in an apiary are affected, they should be burnt to destroy all spores.

Where a large number of colonies in hives are affected, treatment may be merited if the material is good and conditions are suitable. However, in such a case, it will be necessary to make several check inspections at later dates, in order that any further cases arising from spores remaining in the apiary may be dealt with as they occur.

Much has been said during recent years of the use of resistent strains of bees and of therapeutic agents (mainly supha drugs) to combat American Foul Brood. However, it would appear that the replacement of present control measures by the use of these methods is not merited, at least until more is known about them.

The incidence of A.F.B. in America, where resistent strains of bees and drugs have been tried, appears to be much higher than in New South Wales, and in some American apiaries the disease has exacted an annual toll. Under these circumstances the eradication of the disease by burning or treating in the usual way might constitute a very difficult problem and would certainly be very costly. Such a position would merit any measure which would reduce losses due to the disease.

Further results are awaited concerning the effectiveness of drugs in the eradication of A.F.B. It may be the case that the disease will only be partially or temporarily suppressed, and a recrudescence occur when treatment is discontinued. It is far better to maintain an A.F.B.-free apiary, if possible, rather than tolerate the disease, in however mild or suppressed a form. The latter policy could only favour the spread of the disease.

Owing to the fact that A.F.B. eventually kills the colony it attacks, some measures must always be taken to combat it. It cannot be "let go" in the hope that a "self cure" will take place, as in the case of some other diseases of bees.

Nosema Disease Due to a Protozoan (*Nosema apis*).

Nosema apis also gives rise to a spore which is resistent and capable of retaining viability for a considerable period. These spores appear to be very widespread, and occur in apiaries in which no disease symptoms are apparent. The actual presence of the disease organism does not necessarily produce the disease in an apiary. Maintaining a vigorous strain of bees is a factor in preventing the occurrence of this disease. With a disease such as this, it has been found that predisposing causes are often of major importance, although, of course, the actual disease cannot occur in the absence of *Nosema apis*.

Predisposing Causes.—Cold, damp conditions seem to favour the onset of the disease. Once the vicinity of the apiary becomes heavily contaminated with spores, serious losses of bees may occur owing to the large numbers of spores ingested by them. The worker population may dwindle with alarming rapidity so that the beekeeper may even suspect that his bees have been poisoned.

With a disease such as this, the aim of the beekeeper should be to reduce the intake of spores by the bees as much as is possible. Clearing up all dead bees and debris in the vicinity of the hives will help. Contaminated watering places are said to play a big part in the transmission of this disease.

It will, therefore, be seen that the moving of an infected apiary to a fresh site which is uncontaminated with spores of *Nosema apis* will reduce the intake of spores by the bees and so aid their recovery. The recovery of the bees from this disease is speeded up, if conditions are favourable for the breeding up of bees on the site to which the infected apiary has been moved.

A Small Apiary on White Box Country.

Following an outbreak it is advisable to requeen from a vigorous strain.

Sacbrood.

This disease is caused by a virus. This virus, judging by the outbreaks of the disease reported in the spring of 1945 is rather widespread in New South Wales; the outbreaks were more severe on the Northern Tablelands than elsewhere.

In the case of sacbrood, as with Nosema disease predisposing causes play an important role in determining the onset and

(Continued on page 330.)

Australian Wool Realization Commission.

Wool for Appraisement, Season 1945/46

Woolgrowers and others are reminded that Clause 19 of the National Security (Wool) Regulations provides:

(1) All wool shall be submitted for appraisement.

(2) If any person owning, or controlling, or having possession of any wool, fails to submit it for appraisement, he shall be guilty of an offence.

(3) Any wool which is not submitted for appraisement within the wool year may be seized under the authority of the Central Wool Committee and appraised.

The powers conferred by these Regulations on the Central Wool Committee are now vested in the Australian Wool Realization Commission. The Australian Wool Realization Commission, therefore, wishes to notify all growers and others that wool which properly belongs to the wool season 1945-46 must be submitted for appraisement before the 30th June, 1946.

If any wool which, in the opinion of the Commission, properly belongs to the wool season 1945-46 is not submitted for appraisement before the 30th June, 1946, such wool is liable to be seized under the authority of the Commission and appraised under the 1945-46 Table of Limits.

H. B. LEIGH, Secretary.

Melbourne, 8th May, 1946.

THE FEEDING OF WHEAT TO PIGS

Is Soaking the Grain an Advantage?

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IT is commonly believed that the feeding of wheat soaked in water to pigs is preferable to the feeding of dry wheat, it being considered that more rapid weight gains are so obtained. Theoretically, since it is probable that dry wheat is more thoroughly masticated than the wet grain, it would seem more likely that the nutrients would be more readily assimilated when the grain is fed in a dry state. To determine whether any advantage was gained by the soaking of wheat before feeding, a trial was carried out at the Veterinary Research Station, Glenfield.

In addition to the main object of the trial, observations were made on the wastage which it is claimed occurs by the passage of unchanged whole wheat through the digestive system.

The Pigs Used.

Five weaners from two litters of pure-bred Berkshire pigs were used in each of two groups—two pigs from one litter and three pigs from the other. The groups were so selected as to distribute the weights evenly as is shown in the following table:—

Group 1.—Soaked Grain.

Sex	Weight	Age
	lb.	weeks
Barrow	57	13
Sow	56	13
Sow	46	11
Sow	40	11
Barrow	44	11
Total weight	243	—
Mean weight	48·6	—

Group 2.—Dry Grain.

Sex	Weight	Age
	lb.	weeks
Barrow	58	13
Barrow	52	13
Sow	46	11
Sow	43	11
Barrow	47	11
Total weight	246	—
Mean weight	49·2	—

Method of Feeding.

The two groups were fed from iron troughs and were kept in concrete-floored pens throughout the experiment.

Meat meal at the rate of 4 oz. per day per pig was fed throughout the trial.

Green food—mainly green maize or saccaline—was given daily at the rate of 2 lb. per pig at the beginning of the experiment. The amount given was increased to 2½ lb. after two weeks feeding, and four weeks later to 3 lb.

Bone ash was given daily to provide the calcium necessary to pigs on a predominantly grain diet.

Wheat was fed at the rate of 1¾ lb. per pig per day for the first week, and thereafter was increased progressively until at the fourteenth week of feeding the pigs were receiving 6 lb. of wheat each per day. The pigs regularly consumed all the feed given.

The wheat for Group 1 was soaked twelve hours in just sufficient water to swell the grain.

The individual pigs were weighed weekly at approximately the same time each day of weighing. The following table shows the weights at the final weighing on 6th March, 1944, and the gains made by the two groups:—

	Average Weight lb.	Total Weight Gain lb.	Average Weekly Gain lb.
Soaked wheat ...	190.6	142.0	7.8
Dry wheat	196.6	147.4	8.2

The weighings showed that—

1. The soaked wheat group made a total gain of 710 lb. and the whole wheat group 737 lb., the mean gains per pig being 142 lb. and 147.4 lb. respectively.

2. The average weekly gain per pig was 7.8 lb. for the soaked wheat group and 8.2 lb. for the dry wheat group.

The number of pigs used in the experiment was small, but it is doubtful whether the difference in weight gains is of any significance. It is evident that no benefit was derived from the soaking of the wheat insofar as live body weight is concerned.

After slaughter, the carcases were appraised on the system advocated by Davidson, Hammond, Swan and Wright, the mean points for the two groups being respectively:

Soaked wheat	58.3 points
Dry wheat	58.7 points

These figures do not indicate that there was any significant difference in the groups as regards carcase quality.

Wastage by Passage of Whole Wheat in the Faeces.

The dung passed by pigs fed whole wheat appears to contain a considerable quantity of undigested wheat, and the impression gained on viewing the faeces is that there is considerable wastage of grain.

In the experiment described, the whole of the faeces passed in a twenty-four-hours period by each group of pigs was collected and dried. At that stage of the experiment, the pigs were receiving each 5 lb. of wheat per day. Thus the total amount fed to each group was 25 lb. The dried faeces collected in twenty-four hours weighed 2½ lb. in the case of the soaked wheat group and 2¾ lb in the dry wheat.

It must not be assumed from these figures that there was 10 per cent. or more wastage of grain. The dried faeces consisted almost entirely of husks, and although there was present much of what appeared to be whole wheat, these apparently whole grains were found to be empty, the contents having passed out.

In order to ascertain what the loss in nutrients was, the dung was collected and dried, and the husks and what appeared to be grain were sieved out. This was submitted to the Chief Chemist for analysis. He reported that the material consisted almost entirely of the bran layers of wheat grain from which the endosperm or starchy centre had been removed. Analysis showed that it had a composition very close to that of bran.

It is thus evident that although the appearance of the faeces suggests that much wheat passes through the alimentary tract unaltered, the fact is that the loss sustained in this way is comparatively small since the endosperm of the wheat is removed from the bran in the course of digestion.

Summary.

Two similar groups of pigs were fed on a diet of whole wheat, meat meal and greenstuff. The grain fed to one group was dry and that given to the other was soaked in water for twelve hours immediately before feeding. No significant difference was observed in the two groups as regards growth rate and carcase quality.

Physical and chemical examination of the excreta showed that when whole wheat is fed to pigs little loss is occasioned by the passage of undigested grain through the alimentary tract.

Control of Tallowiness in Cream.

A COMMON off-flavour in cream, tallowiness, results in serious economic losses because it is practically impossible to remedy this flavour defect by subsequent treatment of the cream at the factory. As the name suggests, cream possessing this flavour tastes in varying degrees like old tallow. The defect results commonly from oxidation of the butter-fat, a condition which is brought about in various ways, notably by the action of sunlight and by the influence of traces of copper or iron which may be present in the cream.

Methods of control may be enumerated as follows:—

1. Milk or cream should at no time be exposed to the rays of direct sunshine, either at the dairy farm or in the course of transit to the factory.

2. All dairy equipment should be properly tinned and no cream should be allowed to come in contact with rusty patches or areas.

3. Since carelessly-cleaned utensils and equipment may lead to tallowy flavours, particularly where verdigris is allowed to form, as in faulty seams and cracks and crevices in soldered patches, cleaning methods should be thorough.

4. Never mix warm cream with cold cream. Cool the cream before mixing it with previous skimmings.

5. More frequent delivery of cream to the factory will assist in eliminating the defect.

If attention is paid to the above points, little difficulty should be experienced in eliminating the cause of tallowy cream on the dairy farm.

FEEDS and FEEDING NOTES.

Contributed by
The Division of Animal Industry.

THE PROTEIN PROBLEM.

THE restriction on the amounts of peanuts and linseed available for import will result in shortage of peanut meal and linseed meal, two of our most important sources of protein for dairy cattle.

Adequate protein is essential in dairy rations. Insufficient means low production, and high cost of production. Fortunately, the situation can be overcome to a large extent by planning and effort on the part of the individual dairy farmer.

Protein for dairy cattle can be obtained from three sources:—

1. Protein concentrates such as linseed meal and peanut meal;

2. Protein-rich conserved fodders such as lucerne hay and clover hay, which contain about 15 per cent. protein, as against about 6 per cent. in oaten and wheaten hay.

3. Protein-rich grazing such as wheat, oats, barley or rye up to 1 foot in height, and which is young, leafy and succulent; young pastures up to 6 inches in height; or lucerne or clover grazing.

With shortage of the protein concentrates, dairy farmers must obtain their protein from the other two sources. In many cases it will be difficult, but the effort to provide either one or the other—protein-rich roughages or protein-rich grazing—will be repaid by maintenance or increase of production. Failure to provide these sources of protein, when linseed meal or peanut meal becomes unavailable, will mean low production and high cost of production.

Prevent Curled Toe Paralysis in Your Chickens.

Low supplies of bran and pollard and difficulty in obtaining dried butter milk, and skim milk, and liver meal are resulting in cases of curled toe paralysis in chickens. Several cases have been submitted in recent weeks to the Glenfield Veterinary Research Station.

The birds are first noticed to have difficulty in walking, especially when disturbed, and eventually, as the condition becomes worse, squat on their "hocks" with their toes curled inwards and together. Growth rates are usually poor.

Prevention of this condition depends on feeding a ration sufficiently rich in the vitamin riboflavin (*see* Nov. 1945 issue of the *Gazette*). Riboflavin-rich feeds are young, leafy green feed, butter milk powder, skim milk powder, whey powder, liver meal and lucerne meal and, of course, liquid butter milk, skim milk, etc.

Where the dairy products are not available, feed up to 50 per cent. of bran and pollard, if possible, in the ration for chickens, with 10 per cent. of lucerne meal, and give all the green feed that the chickens will eat. Usually 5 per cent. of the dairy by-products is sufficient, with some bran and pollard in the ration and plenty of green feed.

The condition should not be confused with rickets, in which the joints are enlarged and the bones pliable, which is due to Vitamin D deficiency. Provision of vitamin D fish oils or sunlight will not prevent curled toe paralysis.

Birds affected with curled toe paralysis may recover after being put on to a riboflavin-rich ration, but others may retain some unsteadiness of gait for some time. Where supplies of riboflavin-rich feeds are short, keep the limited supplies for chickens up to 6 weeks of age. After this stage, riboflavin requirements decrease.

Prevention of Mammitis in Dairy Cows.

MOST cases of mammitis that occur on the dairy farm are contagious. Not only is the infection transmitted from cow to cow by the milker's hands and by milking machines, but it is also transmitted indirectly. Milk from an affected udder spilt on the floor, brooms and shovels used by milkers who have just milked an infected cow and similar articles of soiled equipment, contamination of the bail partitions—in fact any infected material on or in any part of the milking shed may be a means of spreading the disease.

Therefore when any form of mammitis is present in the herd the affected animal or animals should, if possible, be isolated. They should be hand milked, preferably in bails not used for healthy cows. If a separate attendant is not possible, the cows with mammitis should be milked after the rest of the herd, and the hands washed and disinfected when the milking is finished.

The milk should be drawn into the bucket containing disinfectant and not, as is sometimes done, on to the floor.

Sheep Ked Infestation.

THE economic loss represented by sheep ked infestation is not sufficiently seriously considered, and sheepowners and livestock agents are warned that stricter control of the condition is to be insisted upon.

While it does not constitute the same menace as lice infestation, it is a mistake to assume that ked infestation is of no economic significance or that such infestation cannot be controlled. Wool experts agree that wool from ked-infested sheep, as compared with wool from similar sheep free of infestation, is duller, dingier and lighter. The staining of wool from keds will not scour out. There is also a certain amount of destruction of the wool fibre by the ked. Although the gross weight of ked-infested wool may be greater, this increase is due to the amount of extraneous matter contained therein and actually the scoured weight of the wool will be lighter. Slight ked infestation does not seriously affect the price of wool, but in heavy infestation, particularly in the higher qualities, there may be a reduction of from 3d. to 4d. per pound in value, and in superfine wools even more. This reduction naturally becomes relatively less in the lower grades of wool.

The difficulties experienced during the war years in controlling ked infestation were recognised by the Department and due allowances were made, but now that conditions are more normal, and the position with regard to manpower and availability of rotenone-containing dips has substantially improved, it is considered that the time has arrived for more active measures.—MAX HENRY, Chief, Division of Animal Industry.

Beekeeping Hints—*continued from page* 326.

severity of an outbreak. While colonies of bees numerically weakened by poor conditions, have been considered to be particularly susceptible to sacbrood damage, this is not always the case, and numerically strong colonies are severely affected by the disease at times.

One feature seems to have been fairly constant in recent outbreaks. Bees which spent the winter inland, especially on White Box, appeared to contract the disease, while those colonies wintered on the coast were comparatively free of it.

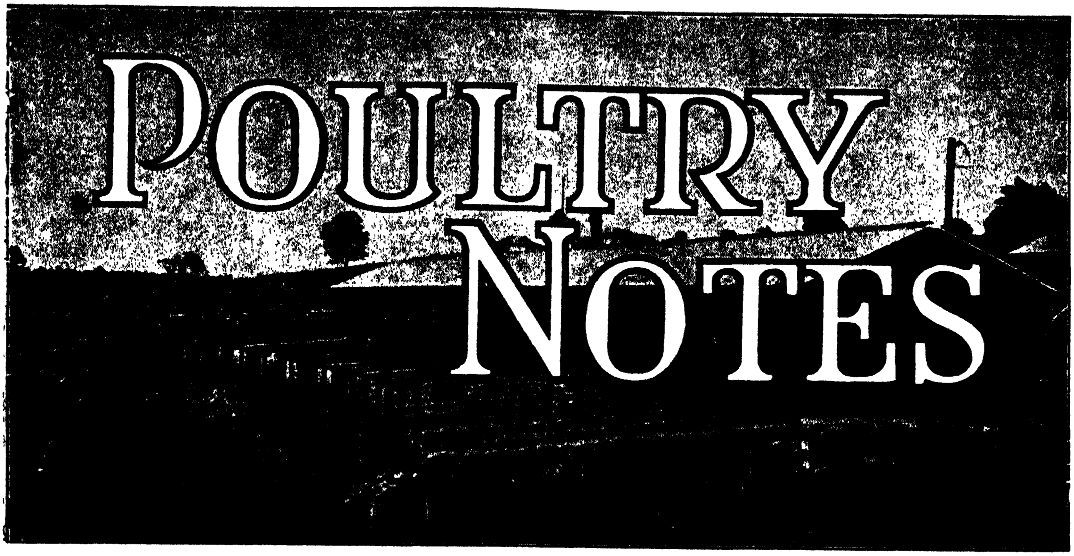
The Relative Importance of Major Bee Diseases in New South Wales.

The losses inflicted on apiaries by sacbrood and Nosema disease may not result in the death of many colonies, but the bees are often seriously weakened numerically, and are consequently unable to make the best of any honeyflows which may follow.

Though A.F.B. is usually considered to be the most serious disease of bees in New South Wales—and it certainly can be the most spectacular in its ravages if not controlled—it is quite possible that diseases such as sacbrood and Nosema disease cause greater losses to the beekeeper, but in an insidious manner.

Conclusion.

It will thus be seen that in order to eradicate or minimise the effects of disease in bees, one must have correct diagnosis and then proceed to apply control measures based on consideration of the presence and nature of the causal agent, disseminating agents and climatic and seasonal influences.



The Rearing Season.

NORMALLY on most commercial farms a start should be made during this month with rearing operations, but again this season feed supplies will be a deciding factor as to the number of chickens which can be reared and the time when they should be obtained.

There does not appear to be any prospects of improvement in the feed supply position, and it is unlikely that even after the next harvest full supplies of wheat will be available. Therefore, the extent of operations this year will largely be governed by the amount of feedstuffs being obtained, and whether sufficient can be conserved for rearing the usual numbers. However, the aim should be to raise as near as possible the normal number of chickens required for replacements, and these should be obtained as early as circumstances permit.

Care of Breeding Stock.

Those who carry out hatching operations on the farm or for the sale of chickens should ensure that everything possible is done to produce sound chickens. The quality and condition of the breeding stock are matters of first importance. Having ensured that birds of sound constitutional vigour have been selected, the next important consideration is to keep them in good condition. This applies particularly to the male birds, which should be handled every couple of weeks to see that they are not becoming poor through allowing the hens to eat more than their share of the food.

Where dry mash is fed, particular attention to the male bird is necessary, especially in the light breeds, as many birds have difficulty in eating out of the feed hoppers on account of their large combs. As soon as any loss of condition is noted, the male should be fed alone—for the mid-day feed at least, but preferably for every feed.

An occasional examination for parasites, such as body lice and red mites, is part of the routine essential to maintain the breeding stock in the best of health, as freedom from these parasites contributes towards successful hatching.

Regulate Hatchings.

In order to ensure that there is no overcrowding of the brooding equipment, a definite programme of hatching operations should be laid down at the beginning of the season to regulate the hatchings in accordance with brooder capacity, making due allowance for reducing the number of chickens in the brooders as they grow.

Those who purchase day-old chickens should also regulate their supplies to suit the brooder accommodation, and thus avoid heavy losses, which in many cases are indirectly due to over-taxing the brooder capacity.

Even though excessive losses of chickens may not be sustained, their development is retarded and this results in economic loss, as the pullets are much slower coming into production. It is this class of bird which is observed on some farms at the present time, many having been hatched during September, and not yet having commenced to lay.

It is far better to raise fewer chickens and attain satisfactory health and development, than to overcrowd and suffer the inevitable consequent losses, particularly towards the end of the season, when the warmer weather increases the risk of heavy mortality.

Points on Brooding.

The first essential to success in rearing is a suitable type of brooder—one capable of maintaining plenty of warmth in the coldest weather and at the same time allowing ample ventilation, also providing for a cooler zone where the chickens can move without obstruction if the temperature becomes too high at any time.

Another important matter, in the case of brooders which are dependent upon coke for heating, is to have a heater with sufficient fuel capacity to last nine to ten hours, so that there need be no anxiety at night as to whether the fire might burn out.

The heater should also be kept going in the daytime in order that the chickens may get warm when desired. Many poultry farmers do not pay sufficient attention to the temperature of the brooders in the day-time, because they fail to realise that the chickens need warmth when they are running about, and if the brooder is not warm enough they will pack together at intervals on a cool day to get warm—which leads to trouble.

The only safe practice is to keep up the temperature of the brooders during the day to the same level as at night, and to increase it a few degrees about an hour before the chickens go up at night, since this is a time when much trouble is caused among chickens on account of the tendency to pack together, even though the temperature of the brooder is high enough for ordinary times. If the brooder is cool the chickens crowd together and sweat, which is one of the greatest evils of brooding. To guard against this trouble it is necessary to have the brooders thoroughly warm, and the attendant should see the chickens comfortably settled down before leaving them.

Brooder Temperature.

A practice which causes much unthriftiness among chickens and is often responsible for high mortality is the reduction of the brooder temperature too quickly after the first week. Cases have come under notice where the temperature has been reduced to 75 degrees Fahr. during the second week, which resulted in the chickens packing together for warmth, and losses followed.

It should be realised that in working a heated brooder, any sudden reduction in temperature will cause trouble, and experience has shown that 95 degrees is desirable when the chickens are first put into the brooder, and that there should be a reduction of 3 to 4 degrees each week, so that by the end of six weeks the chickens can be taken away from the heated brooder.

Standard for Rhode Island Reds.

IN response to requests for particulars of the standard for Rhode Island Reds, the details, as published in the English Poultry Club Book of Standards are given hereunder. The accompanying illustrations are not taken from the book mentioned.

GENERAL CHARACTERISTICS.

The Cock.

Head.—Skull strong but not thick. Beak curved, moderately long. Eyes large and bright. Comb (*a*) single, or (*b*) rose: (*a*) medium size, upright, straight and firmly set, with five even serrations; (*b*) low and firm, oval top covered with small points and terminating in a small spike, following the curve of the head. Face smooth. Ear-lobes fine texture, well developed and pendent. Wattles of medium size and moderately rounded.

Neck of medium length and profusely covered with hackle flowing over the shoulders, but not too loosely feathered.

Body fairly deep, broad and long, but a distinct oblong rather than square; broad and full breast; long back, horizontal except where the neck-hackle flows over the shoulders and the saddle gently rises; large wing well folded and the flights horizontal; fairly small tail, sickles passing a little beyond the main feathers, well spread, and

carried somewhat low (but by no means drooping) to increase the apparent length of the bird.

Legs of medium length; large thighs; well rounded shanks free of feathers. Toes (four) straight, strong, and well spread.

Carriage alert, active, and well balanced.

Weight 8½ lb.; cockerel 7½ lb.

The Hen.

The general characteristics are similar to those of the cock, allowing for the natural sexual differences.

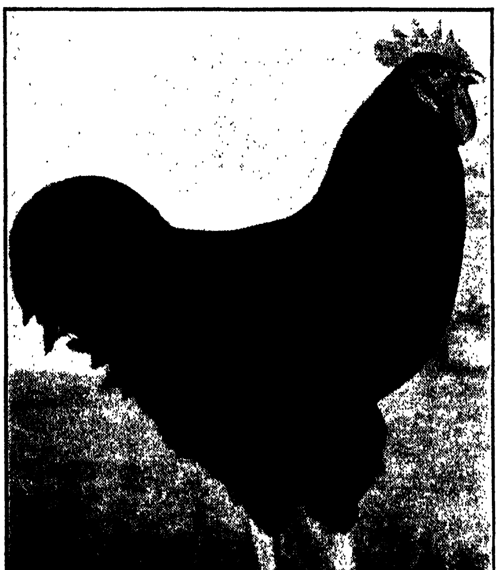
Weight 6½ lb.; pullet 5 lb.

Colour.

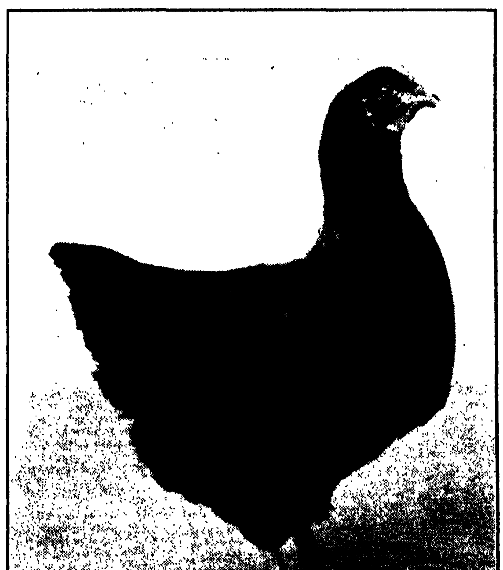
Beak red-horn or yellow. Eyes red. Comb, face, earlobes and wattles brilliant red. Legs and feet yellow or red-horn.

Plumage of the cock.—Hackle red, harmonizing with back and breast. Wing: primaries, lower web black, upper red; secondaries, lower web red, upper black; flight coverts black; bows and coverts red. Tail (including sickles) black or green-black; coverts, mainly black, but may be russet or red as they approach the saddle. Remainder, general surface rich brilliant red, except where black is specified, free from shafting, mealy appearance, or brassy effect; depth of colour (red) is slightly accentuated on wing bows and back, but the least contrast between these parts and the hackle or breast the better, a harmonious blending desirable. The bird should be of so brilliant a lustre as to have a glossed appearance. The under-colour and quills of the feathers should be red or salmon. With the saddle parted showing the under-colour at the base of the tail, the appearance should be red or salmon, not white or smoke. Black or white in the under colour of any section is undesirable. Other things being equal, the specimen having the richest undercolour shall receive the award.

Plumage of the hen.—Hackle red, the tips of the lower feathers having a black ticking but not a heavy lacing. Tail black or green-black. Wings as in the cock. Remainder, general surface lighter and more even than in the male, free from shafting or mealy appearance, and except where black is specified, a rich even shade of bright red, not as brilliant a lustre as the male. The undercolour and quills of the feathers should be red or salmon. Black or white in the undercolour of any section is undesirable. Other things being equal, the specimen having the richest undercolour shall receive the award.



Rhode Island Red Cock.



Rhode Island Red Hen.

Scale of Points.

Colour (plumage, etc., 25, eyes 5)	30
Type, including size	30
Quality and texture	15
Head	10
Condition	10
Legs	5
	100

Serious defects.—Feather or down on shanks or feet, or unmistakable indications of a feather having been plucked from the same; badly lopped combs, side sprig or sprigs on the single comb; entire absence of main tail feathers; two absolutely white (so-called wall or fish) eyes; a feather entirely white that shows in the outer plumage; an earlobe showing more than one half the surface permanently white (this does not mean the pale earlobe, but the enamelled white); shanks and feet other than yellow or red-horn; any deformity.

Waster—Or High Producer?

Only the Tester Can Tell.

ALL experience goes to show that it is futile to speak of the productive ability of a dairy cow except as proven by her test.

When herd recording was first introduced by the Department it was contended by many farmers that they could tell what their cows were doing without putting them under record, merely by relying upon those outward characteristics usually identified with high producers, but a check up on farmers' placing of the various animals in their herds by means of the Babcock test showed their declared preferences to be frequently unjustified and their judgment in some cases spectacularly at fault.

A man experienced with dairy stock should, admittedly, be able to make a fairly accurate estimate of the comparative milk productive ability of cows that he is milking every day, but such an estimate is not sufficient if his object is maximum profit. A primary object with any dairy farmer must be to determine beyond argument which cows it best pays him to feed, and without recording this is not possible. Many animals yield well, but their milk is not of a sufficiently high butter-fat content. Many apparently good milkers, again, cannot stay the distance, but fall off in production toward the end of their lactation period.

Farmers to-day are realising that mere conjecture can be costly in relation to milk and butter production, and the recent re-establishment of the Department's herd recording scheme on an improved and simplified basis is being widely welcomed.

Herd recording not only identifies the low producers. Systematically applied, it enables the periodical replacement of the poorest producers by the pick of the farm-bred cows, and a constant check-up on the whole feeding and breeding programme, and thereby a continuous improvement of the earning power of the herd. Farmers who desire to join a herd-recording unit or learn more about the scheme should contact their district dairy instructor or communicate with the Division of Dairying, Department of Agrculture, Box 36A, G.P.O., Sydney.—G. MCGILLIVRAY, Chief Division of Dairying.

Lameness in Lambs Often Follows Marking.

LAMENESS in lambs may be due to a variety of causes, but the commonest cause is inflammation of the joints of the legs, and of the various types of this condition non-suppurative arthritis is probably the form which is most frequently encountered. It is caused by a specific germ, which, after entering the animal's body, invades the blood stream and then rapidly establishes itself in the joints. A common means of infection is contamination of wounds following tailing or marking, emphasising the need for marking lambs on clean ground.

The operation should be carried out away from sheepyards and sheep camps. Contaminated soil is an important source of infection, and consequently it is useless taking meticulous precautions against infection during operations if the sheep are permitted to return to their old camps. Here the lambs will lie down with the fresh wounds in contact with the badly infected ground. The ideal is to confine the sheep with a temporary fence to a well-grassed area and to keep them there for several days until well-formed scabs cover the wounds.

Prior to marking, the instruments should be sterilised; an antiseptic dressing applied to the wounds will assist in reducing infection and keeping flies away. These precautions are all that can be reasonably carried out in the field, and, while not completely eliminating all risks of the disease, will materially reduce its incidence.—DIVISION OF ANIMAL INDUSTRY.

Tubercle-free Herds.

THE following herds have been declared free of tuberculosis in accordance with the requirements of the scheme of certifying herds tubercle-free, and, unless otherwise declared, this certification remains in force until the date shown in respect of each herd :—

Owner and Address.	Number Tested.	Expiry Date.
Registered Stud Herds.		
Bathurst Experiment Farm (Guernseys)	28	12/10/46.
Berry Training Farm, Berry (A.I.S.)	129	16/10/46.
H. F. Bradley, "Nardoo," Ashford Road, Inverell (Jerseys)	40	13/4/47.
L. W. Campbell, "Dunmallard," Fern Hill Road, Inverell (Jerseys)	39	21/7/47.
E. J. Cattell, "Kapunda," Rob Roy, Inverell (Jerseys)	121	30/6/47.
E. Chegwidden, "Austral Park," Berry (Jerseys)	88	14/1/47.
Christian Bros, Novitiate, Mt. St. Joseph, Mintc..	25	11/9/46
B. N. Coo Auburn Vale Road, Inverell (Jerseys)	85	23/7/47.
Cowra Experiment Farm (Ayrshires)	53	9/7/46.
Department of Education, Yanco Agricultural High School (Jerseys)	64	1/3/47.
R. C. Dixon Elwatan, Castle Hill (Jerseys)	29	5/3/47.
C. P. Fairbairn, Woomargama	173	17/3/48.
Farm Home for Boys, Mittagong (A.I.S.)	31	24/7/46.
Farrer Memorial Agricultural High School, Nemingha (A.I.S.)	44	28/8/47.
N. L. Forster, Abington, Armidale (Aberdeen-Angus)	164	19/5/46.
Forster and Sons, Abington, Armidale (Jerseys)	86	19/5/46.
A. D. Frater, King's Plain Road, Inverell (Guernseys)	107	11/4/47.
W. G. A. & F. J. Frendenstein, "Chippendale," Grenfell Road, Young (Beef Shorthorns)	47	15/1/47.
Grafton Experiment Farm (A.I.S. and Aberdeen-Angus)	249	30/7/46.
Hawkesbury Agricultural College, Richmond (Jerseys)	119	19/3/47.
Hurlstone Agricultural High School, Glenfield (Ayrshires)	52	21/7/46.
Kahlua Pastoral Co., "Kahlua," Coolac (Aberdeen-Angus)	257	30/11/47.
E. L. Killen, "Pine Park," Mumbil (Beef Shorthorns)	261	25/9/46.
G. Knight, Tannabah, Coonabarabran	60	30/11/46.
Lidcombe State Hospital and Home (Friesian)	111	3/10/46.
Limond Bros., Morisset (Ayrshires)	64	26/4/47.
McGarvie Smith Animal Husbandry Farm, Liverpool (Jerseys)	72	22/2/47.
W. W. Martin, "Narooma," Urana Road, Wagga (Jerseys)	160	11/7/46.
Navua Stud Farm, Grose Wold, via Richmond (Jerseys)	120	8/10/47.
New England Experiment Farm, Glen Innes (Jerseys)	46	18/3/47.
G. H. Newnan. "Bunnigalore," Belanglo (Jerseys)	38	2/12/46.
Peel River Land and Mineral Co., Tamworth (Poll Shorthorns)	110	16/10/46.
W. R. Raper, Calool, Culcairn (Beef Shorthorns)	86	7/3/46.
D. B. Reid, "Evandale," Sutton Forest (Aberdeen-Angus)	61	23/11/47.
Riverina Welfare Farm, Yanco (Jerseys)	130	26/6/46.
F. S. Simpson "Gunnawarra," Gulargambone (Beef Shorthorns)	167	19/11/47.
Trangie Experiment Farm, Trangie (Aberdeen-Angus)	155	11/3/47.
Wagga Experiment Farm (Jerseys)	15	1/2/47.
Wallaga Lake Aboriginal Station	19	29/4/47.
H. F. White, Bald Blair, Guyra (Aberdeen-Angus)	300	20/4/47
Wollongbar Experiment Farm (Jerseys)	110	16/3/47.

Owner and Address.	Number Tested.	Expiry Date.
A. Young, "Daylesford," Cudal (Beef Shorthorns)	23	25/2/47.
Herds Other than Registered Stud Herds.		
114 A.G.H., Kenmore	70	6/6/46.
Aboriginal Station, Brewarrina	14	20/5/46.
Aboriginal Station, Wallaga Lake	19	29/2/46.
Australian Missionary College, Cooranbong	100	30/8/47.
Barnardo Farm School, Mowbray Park	45	25/5/46.
Brookfield Afforestation Camp, Mannus	243	3/5/46.
N. Cameron, Montrose, Armidale (Late New England Girls' School)	33	20/2/47.
A. N. De Fraine, Reservoir Hill, Inverell	21	8/6/47.
Department of Education, Gosford Farm Home	37	26/2/47.
Ehsman Bros., Inverell	31	22/8/46.
Emu Plains Prison Farm	115	29 1/47.
Fairbridge Farm School, Molong	25	15/4/46.
F. J. Foy, The Valley Farm, Megalong Valley	25	18/12/47.
W. J. Frizelle, Rosenstein Dairy, Inverell	134	16/8/47.
Goulburn District Hospital	5	6/11/46.
W. S. Grant, "Monkittee, Braidwood	23	29/4/47.
A. Hannaford, Braidwood	10	7/2/46.
F. C. Harcombe, Hillcrest Farm, Warialda Road, Inverell	53	10/4/47.
F. W. Hunt, Spencers Gully	27	16/2/47.
Koyong School, Moss Vale	2	5/3/46.
J .H. Lott, "Bellevue," Rob Roy, Inverell	41	26/6/47.
Lunacy Department, Callan Park Mental Hospital	43	4/4/47.
Lunacy Department, Gladesville Mental Hospital	20	15/4/46.
Lunacy Department, Morisset Mental Hospital	79	8/3/47.
Lunacy Department, Parramatta Mental Hospital	62	26/7/47.
Lunacy Department, Rydalmere Mental Hospital	57	30/10/46.
J. O. McGufficke, "Lovely Bank," Rob Roy, Inverell	33	25/6/47.
R. G. P. McLane, Ibis Valley, Swanbrook	36	29/5/46.
S. W. Morris, "Dunreath," Swanbrook Rd., Inverell	43	8/6/46.
J. A. Murray, "The Willows," Keiraville	21	8/8/46.
New England University College, Armidale	19	1/5/47.
Orange Mental Hospital	63	19/3/47.
Parker Bros., Hampton Court Dairy, Inverell	125	25/8/47.
Peat and Milson Islands Mental Hospital	25	6/9/46.
G. T. Reid, "Narrengullen," Yass	167	14/7/46.
C. E. D. Richardson, Kayuga Road, Muswellbrook	101	3/7/46.
V. J. Rolfe, "Mount View," Inverell	18	9/2/47.
St. John's College, Armidale	11	20/2/47.
St. Michael's Orphanage, Baulkham Hills	26	1/6/46.
St. Patrick's Orphanage, Armidale	10	15/11/46.
St. Vincent's Boys' Home, Westmead	37	3/7/46.
State Penitentiary, Long Bay	13	30/11/47
W. J. Stephenson, "Hill View," Fig Tree	53	1/4/47.
The Sydney Church of England Grammar School, Moss Vale	48	18/12/47.
J. M. Turnbull, "Pastime," Kayuga Road, Muswellbrook	85	20/3/47.
A. B. Weidman, No. 2 Dairy, Aberdeen Road, Muswellbrook	68	3/9/46.
A. B. Weidman, No. 3 Dairy, Kayuga Rd., Muswellbrook	38	6/9/46.
A. B. Weidman, No. 4 Dairy, Kayuga Rd., Muswellbrook	57	2/11/46.
T. J. Wilks, "Oaks Farm," Muswellbrook	27	27/6/46.
A. G. Wilson, "Blytheswood," Exeter	66	23/4/47.
C. Wilton, Bligh Street, Muswellbrook	54	12/5/46.
Youth Welfare Association of Australia	142	19/3/46.

Tubercle-free Areas.

The following Areas have been declared tubercle-free and no cattle are allowed to be kept therein unless subjected to the tuberculin test and found free from tuberculosis :—

Bombala Area.
Inverell Area.
Braidwood Area.
Municipality of Muswellbrook.
Municipality of Queanbeyan.

MAX HENRY, Chief of Division of Animal Industry.

Brucellosis-free Herd Scheme (Swine).

THE following is a list of the names and addresses of owners of herds which have been declared brucellosis-free in accordance with the requirements of the Brucellosis-free Herd Scheme (Swine). The work in connection with this scheme has been undertaken as part of the general campaign against this disease and should perform a valuable service to the industry generally. Owing to the limitations of staff it will not be possible for the Department to undertake the testing of herds in general for this purpose, and in future only herds belonging to Government institutions, registered stud herds, or those containing a preponderance of registered stud animals, will be accepted for inclusion in the list. A charge will be made for the work, since the inclusion of a herd in this list should be of benefit to the owner. After a herd has been accredited, two semi-annual tests will be required, and thereafter annual tests, provided that the conditions outlined in the agreement form are strictly adhered to and that negative results are obtained at each test. So far as the elimination of the disease is concerned, apart from placing the herd on the accredited list, this work will continue as at present.

Registered Stud Herds.

Bathurst Experiment Farm, Bathurst.
Boardman, C. M., "Fairview," Camden.
Campbell, D., "Hillangrove," Wamberal via Gosford
Coo..s, F. D., "Condalarra," Goolagong.
Cowra Experiment Farm, Cowra.
Croft, F., Lugwardine, Kentucky.
Draper, R. E., "Glengar," Capertee.
Farrer Memorial Agricultural High School, Nemingha.
Foley, J. B., Gundurimba Road, Loftville, via Lismore.
Garrison Battalion (2nd), Manly.
Gladesville Mental Hospital.
Government Agricultural Training Farm, Scheyville.
Grafton Experiment Farm, Grafton.
Harris, K. H., Pennant Stud Piggery, Purchase Road, West Pennant Hills.
Hawkesbury Agricultural College, Richmond.
Holland A. L., Argonne, Tubbul.
Hurlstone Agricultural High School, Glenfield.
Maybin, N. C., Towac, Orange.
New England Experiment Farm, Glen Innes.
Newington State Hospital and Home, Newington.
Ricketts, C. C., "Mangus," Young.
Riverina Welfare Farm, Yanco.
Rydalmere Mental Hospital.
Shirley, G. F., "Camelot," Penrith.
Upston, H. E., Wattle Tree Road, Holgate via Gosford.
Wagga Experiment Farm, Wagga.
Waterfall Sanatorium, Waterfall.
White, A. N., Blakeney Stud, Orange.
Williams, G. R. B., "Gwandalan," Grenfell.
Wollongbar Experiment Farm, Wollongbar.
Yanco Agricultural High School.

Herds Other than Registered Stud Herds.

A G.H. (114 Australia).
Bathurst Gaol, Bathurst.
Brookfield Afforestation Camp, Mannus.
Callan Park Mental Hospital, Callan Park, Rozelle.
Emu Plains Prison Farm.
Glen Innes Prison Camp, Glen Innes.
Gosford Farm Home for Boys, Gosford.
Goulburn Reformatory, Goulburn.
Higgins J. P., "Koranga," Camden.
Lidcombe State Hospital.
Morisset Mental Hospital, Morisset.
Orange Mental Hospital.
Parramatta Gaol, Parramatta.
Parramatta Mental Hospital.
Peat and Milson Islands Mental Hospital Hawkesbury River.

Abortion-free Herds.

THE following herds have been declared free of contagious abortion (Bang's disease) in accordance with the requirements of the scheme of certifying herds abortion-free :—

Owner and Address.	Number in herd.
Registered Stud Herds.	
Armstrong, K. A., "Heathfield," Boorowa	23
Bathurst Experiment Farm (Guernseys)	28
Cowra Experiment Farm (Ayrshires)	71
Department of Education—Farm Home for Boys, Mittagong (A.I.S.)...	52
Dixson, R. C., "Elwatan," Castle Hill (Jerseys)... ...	29
Fairbairn & Co., C. P., Woomargama (Beef Shorthorns)	98
Farrer Memorial Agricultural High School, Nemingha (A.I.S.)	44
Forster and Sons, Abington, Armidale (Jerseys) ...	59
Forster, N. L., Abington, Armidale (Aberdeen-Angus) ...	179
Hann, O., Chatsworth Road, St. Marys (Jerseys) ...	14
Hann, O., "Bomerah," Barrington (Jerseys)	42
Hawkesbury Agricultural College, Richmond (Jerseys) ...	96
Hill, E. Pritchard, Bowling Alley Pt. (Jerseys)	96
Hordern, E. D., Cabramatta (A.I.S.)	95
Hurlstone Agricultural High School, Glenfield (Ayrshires)	53
Killen, E. L., Pine Park, Mumbil...	161
McEachern, H., Tarcutta (Red Poll)	61
McSweeney, W. J., "The Rivers," Canowindra (Beef Shorthorns)	76
Martin Bros., "Narooma," Urana-road, Wagga (Jerseys)	160
Navua Stud Farm, Grose Wold, via Richmond (Jerseys)	120
New England Experiment Farm, Glen Innes (Jerseys) ...	32
Peel River Land & Mineral Co., Tamworth (Poll Shorthorns)	86
Raper, F. S., Calool, Culcairn	80
Riverina Welfare Farm, Yanco	135
Simpson, F. S., "Gunnawarra," Gulargambone (Beef Shorthorns)	150
Training Farm Berry	118
Trangie Experiment Farm, Trangie (Aberdeen-Angus)	148
Wagga Experiment Farm, Wagga (Jerseys)	25
Walker, Jas. R., "Strathdoon," Wolseley Park (Red Polls)	42
White, F. J., and Sons, Bald Blair, Guyra (Aberdeen-Angus)	152
Whitelaw, L. A.. "Wendouree," Merriwa (Beef Shorthorns)	79
Wollongbar Experiment Farm (Guernseys)	110
Young, A., "Rocklynne," Cudal (Polled Beef Shorthorns)	27
Herds Other than Registered Stud Herds.	
A. G. H. (114th Australia)	66
Callan Park Mental Hospital	44
Department of Education—Farm Home for Boys, Gosford	37
Fairbridge Farm School, Molong	89
Morisset Mental Hospital	66
New England University College, Armidale	20
Orange Mental Hospital	61
Parramatta Mental Hospital	30
Peat & Milson Islands Mental Hospital	25
Royal Prince Alfred Hospital, Camperdown : "Yaralla" Herd	94
Rydalmere Mental Hospital, Rydalmere	57
Salway, A. E., Cobargo	87

MAX HENRY, Chief of Division of Animal Industry.

EDITORIAL—

Beware of Grasshoppers.

Major Infestation Forecast.

A GRASSHOPPER plague, perhaps equal to the worst experienced in New South Wales, threatens the whole of the Central Division and parts of the Eastern Division of the State. Egg-beds are widespread over most districts in the Central Division, and if conditions favour hatching next spring, swarms, unless controlled, could extend their field of destruction anything up to 100 miles beyond the boundaries of the present danger area. This would menace practically the whole of the wheat belt, the best of the mixed farming areas, and thousands of square miles of sheep pastures.

Already the Department of Agriculture has gone into action against the threatened plague.

Field officers have been directed to assist landholders to locate egg-beds, to watch (later on) for hatching and swarming, to advise on methods of control, and generally to invite full co-operation by local authorities and landholders. To keep grasshopper damage to a minimum, organised community effort is essential.

A senior entomologist has been assigned the job of visiting all affected areas to instruct landholders and to advise Pastures Protection Boards on control. A liaison officer has been appointed to ensure uniformity of organisation and action on all danger areas.

The Department, further, will provide machinery for ordering materials should a control campaign prove necessary in the spring. Pastures Protection Boards and branches of the Agricultural Bureau have been warned of the likelihood of a major infestation and have been requested to take preliminary steps to combat the pest.

The most intensive campaign will not eradicate grasshoppers, but it will reduce losses of crops, pastures and stock to a minimum. Money spent on this work is a good investment for the individual and the State. In perhaps the worst grasshopper plague ever experienced in New South Wales—that of 1937-1938—only about £45,000 was spent on control. Practically no wheat crops were lost and tens of thousands of acres of pastures were saved from destruction, which prevented big stock losses. Furthermore, grasshoppers are among the worst agents of soil erosion—a fact not sufficiently appreciated.

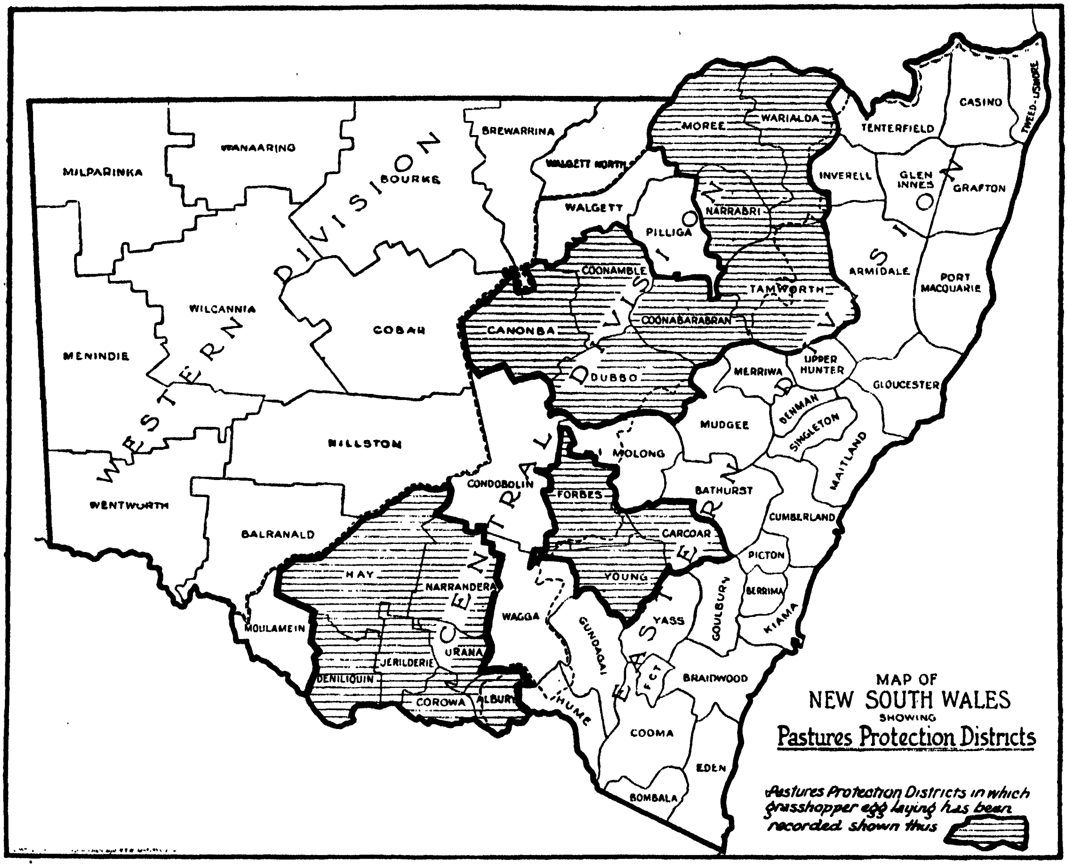
The monetary losses caused by grasshopper destruction of crops and pastures in other countries are staggering, and there is no evidence on which to base a claim that the Australian grasshopper (or plague

locust) is any less destructive if allowed free range.

In U.S.A. for the five-year period 1934-1938, grasshoppers destroyed crops valued at about £100,000,000. That country, like this State, had a major infestation in 1938. Crops destroyed in that year amounted to £22,000,000, but crops valued at £47,000,000 were saved as a direct result of an organised control campaign which cost only £600,000. In other words, the saving in crops alone, to say nothing of pastures and stock losses, was eighty times greater than expenditure.

In all reports on grasshopper control methods, the world over, two points are emphasised:—(1) A major infestation must be fought on a community basis; and (2) poison bran bait is the cheapest and most effective control measure.

The New South Wales Noxious Insects Act gives Pastures Protection Boards power to finance, organise and compel landholders to carry out effective control. Boards, by their efforts, made a good save in the 1937-1938 outbreak. There is a double incentive this time—preservation of the individual landholder's interests, and the need for conserving all available food supplies to meet the needs of starving millions in other countries.



THE production of meat in Britain has fallen by over 200,000 tons a year since 1939, and the production of butter in Britain is only about 25 per cent., and of cheese about 50 per cent., of what it was in the same year. It is true that the total production of food in Britain has increased greatly, but the increases have mostly taken place in items such as liquid milk, wheat, barley, oats, vegetables, potatoes and other root crops. Consequently the great agricultural development in Britain during the war has not reduced the market for Australian meat and dairy produce.—MR. W. BANKS AMERY, former leader of the United Kingdom Food Mission to Australia and New Zealand, in a recent broadcast.

THE COVERAGE OF TRACTOR-DRAWN IMPLEMENTS.

How Many Acres Per Hour?

●

USEFUL CHARTS.

E. J. WARING, B.Sc.Agr., Scientific Assistant.

DESPITE the widespread use of farm tractors, many operators are unable to state, with any degree of certainty, the area of land traversed per hour by a tractor pulling a particular implement. This information, useful on any farm where tractors are used, is of particular value where contract work is undertaken.

The accompanying charts enable the acreage covered per hour by machines of any width, travelling at any speed above 1 m.p.h. to be calculated simply.*

Many other uses will be found for the graphs on farms where implements are tractor-drawn. Some of these which will assist in the more efficient use of farm power are discussed.

The charts may be used to determine the most economical speed and width of implement to employ on any task; they enable the farmer to determine the speed of travel necessary to accomplish a task at a given rate of acres per hour with an implement of specified width, and conversely, the width of implement necessary to attain a given rate of acres with travel at specified speed.

To Use the Charts.

To use the charts to determine acreage covered by an implement at a given speed, first find the line in the left-hand vertical column corresponding with the effective working width of the implement. Follow this line across the chart until it reaches the diagonal line representing the speed of travel in the working gear. Then follow the vertical line from this point to the bottom of the chart and read the hourly acreage shown at the intersection with the base line. Thus from the first chart it is seen that using an implement 16 inches wide at 2½ m.p.h., the area covered in 1 hour is 4/10 of an acre; and from the second chart it can be calculated that when using an implement 8 feet wide at 4½ m.p.h., the area covered is 4.4 acres.

For implements over 9 feet wide determine the acreage covered by an implement half as wide, and multiply this result by two.

*The results given by the chart are for effective working hours and allowance should be made for stops and turning on headlands.

Intermediate speeds to those shown on the charts can be judged by eye or plotted as required, e.g., the line for 3¼ m.p.h., if drawn, would be equidistant from those for 3 m.p.h. and 3½ m.p.h. and would intersect the horizontal lines midway between them. Take as an example, using an intermediate speed, determination of the area covered per hour by a farmer using a 6 feet cultivator travelling at a speed of 2¾ m.p.h. On the second chart, trace the horizontal line representing 6 feet width to a point halfway between the diagonals representing 2½ m.p.h. and 3 m.p.h. respectively. Run down vertically from this point and read off the acreage covered, which it will be seen is just under 2 acres per hour.

Where the area inter-row cultivated per hour is the problem, and only one row is cultivated at a time, the determination of the rate per acre is effected by regarding the distance apart of the rows as the width of the implement; where several rows are handled at the one time consider the effective working width of the implement to be the total number of rows treated in one operation, multiplied by the distance between the rows.

The charts may be used to determine the size of implement required to cover an area at a given rate per acre. By following up the vertical line representing, for example, three acres per hour, and then reading horizontally from the point at which it meets the diagonal lines representing speeds in

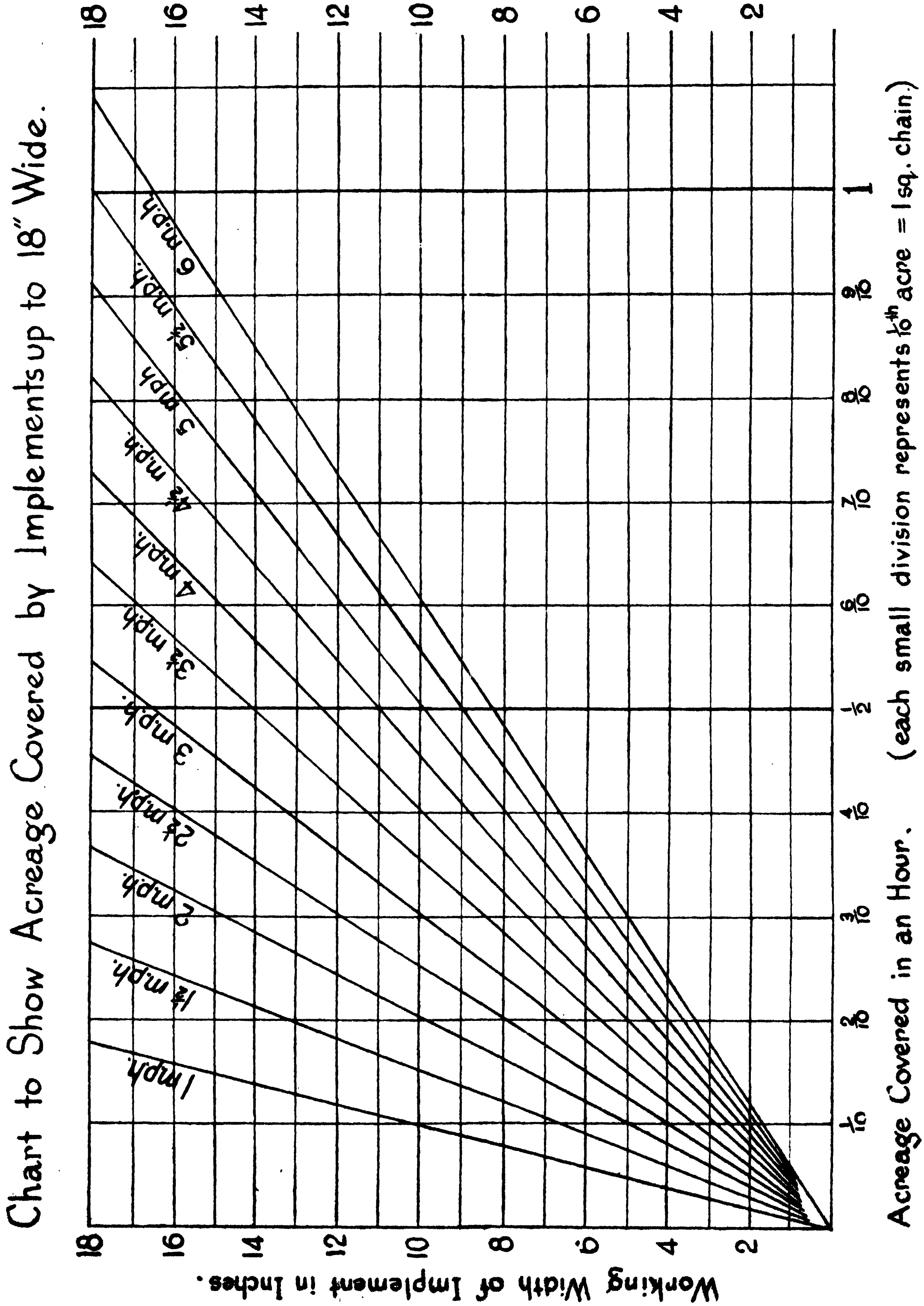
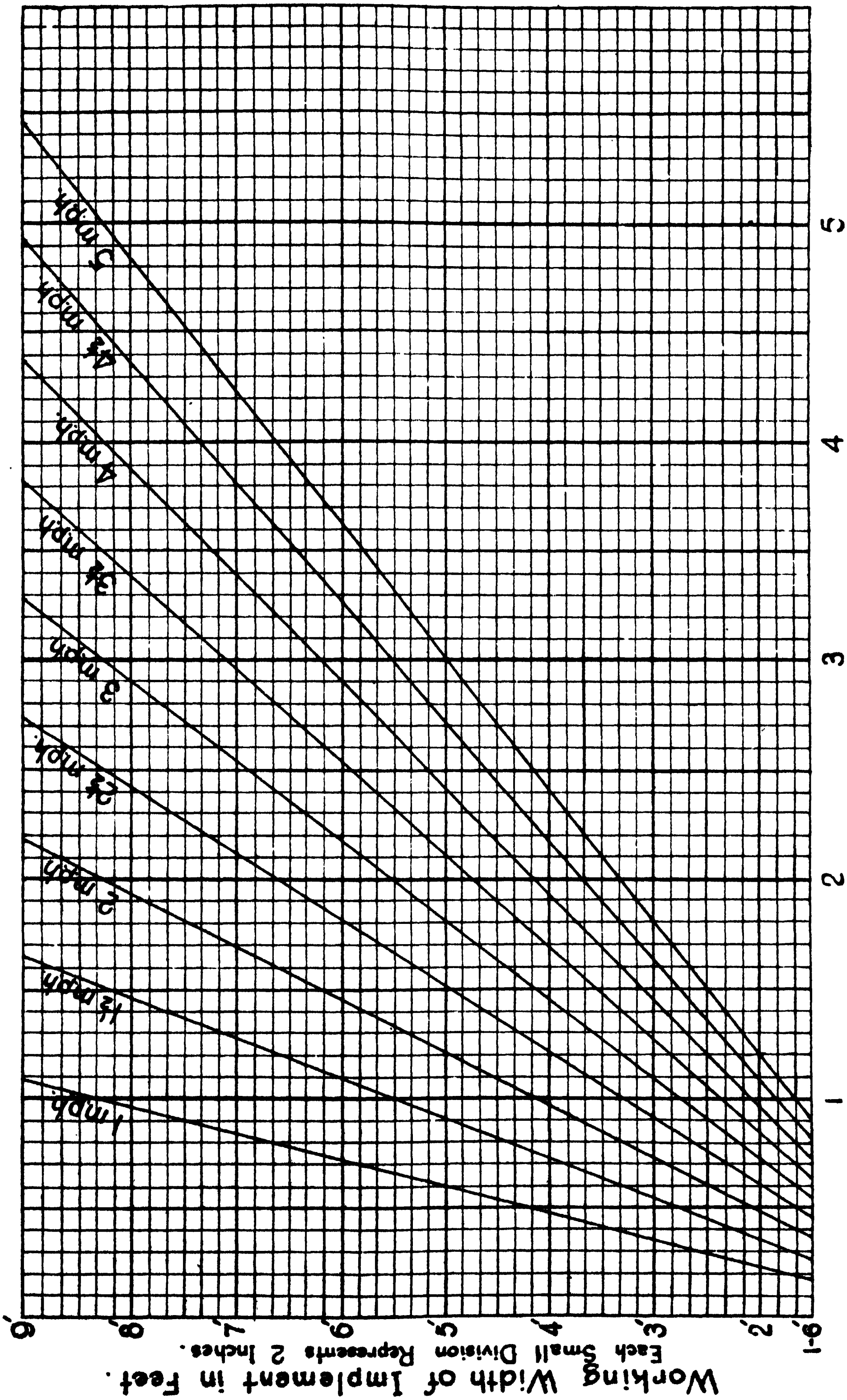


Chart to Show Acreage Covered by Implements up to 18" Wide.
Acreage Covered in an Hour. (each small division represents 1/10th acre = 1 sq. chain.)
1/10 2/10 3/10 4/10 1/2 6/10 7/10 8/10 9/10 1
Working Width of Implement in Inches.
2 4 6 8 10 12 14 16 18
1 m.p.h.
1¼ m.p.h.
2 m.p.h.
2½ m.p.h.
3 m.p.h.
3½ m.p.h.
4 m.p.h.
4½ m.p.h.
5 m.p.h.
5½ m.p.h.
6 m.p.h.

Chart to Show Acreage Covered by Implements from 18" Wide up to 9' Wide.



m.p.h., it can be seen that to cover an acre in one hour requires:—

At 5 m.p.h., a 60-inch implement.
At 4½ m.p.h., a 66-inch implement.
At 4 m.p.h., a 75-inch implement.
At 3 m.p.h., a 100-inch implement.

Economy of Operation Can be Checked.

When an implement is to be worked which is not specially selected for the particular make of tractor in use—e.g., where a new tractor has been purchased and it is to be used with existing equipment—it frequently happens that the tractor cannot be used with the cultivation implements with the greatest economy.

A frequent mistake is attempting to pull too large an implement, with the result that the tractor is overloaded, or has to be worked in a gear lower than the usual working gear. Overloading can be detected by observing the operation of the engine governor when pulling the load. The engine speed should vary slightly as the load fluctuates due to variation in the slope and nature of the ground. If the engine runs at its maximum speed continuously and the governor remains fully open, it is certain that the engine is being overloaded and a change to a lower gear is advisable.

An implement which is too heavy to pull in one gear, may sometimes be pulled with power to spare in the next lower gear, with consequent waste of time and fuel. With an implement such as a 7-furrow mouldboard plough, or rigid tyne scarifier, it may be more economical to remove one or more mouldboards or tynes and operate at greater speed in a higher gear.

Suppose the two speeds available are 2¾ and 3½ m.p.h. and an 8 feet implement is available which cannot be pulled in the higher gear. Now an 8-feet implement at the lower speed—2¾ m.p.h.—will cover two and two-thirds acres in an hour. By removing three points, the working width of the implement might be reduced to 6 feet 9 inches, permitting operation at 3½ m.p.h. in the next higher gear. A glance at the chart, shows that working at this higher speed (3½ m.p.h.) a 6 feet 9 inches implement will cover just under 2.9 acres per hour, which is obviously a better proposition and allows more efficient use of the tractor.

Use can be made of this experience when new machinery is purchased, the speeds of the tractor being known in its various gears.

Other Uses of the Chart.

Not only may the chart be used to calculate the area covered per hour at a given speed and given spread of seed or fertiliser, but a further use is as a check on the rate at which the fertiliser or seed is being distributed. With a manure spreader 12 feet wide, pulled at 3½ m.p.h., it may be desired to spread 1 cwt. of superphosphate to the acre. Three bags of superphosphate weigh 5 cwt., and should, therefore, cover 5 acres. By use of the chart it will be seen that a 6-feet implement travelling 3½ m.p.h. covers just a fraction over 2½ acres per hour, so a 12 feet implement will cover approximately 5 acres per hour. At the end of one hour's work, therefore, the operator should have used three bags of superphosphate if the spreading rate is adjusted correctly, or one bag every 20 minutes.

When spraying weeds, and for similar operations, rates of application can be controlled as follows:—

Suppose the spray nozzles deliver 1 gallon per minute, i.e., 60 gallons per hour, and it is desired to spread 25 gallons per acre, the machine must cover 60 ÷ 25, equals 2.4 acres per hour, to obtain the desired rate of application. Consult the chart for width covered by sprays, say 9 feet and run across this horizontal line to where it meets the vertical line representing a coverage of 2.4 acres per hour. Then estimate the speed represented by a diagonal line drawn through this point. It will be seen that it is between 2 and 2½ m.p.h. (actually 2.2 m.p.h. or 2¼ m.p.h. approximately).

When using tractor power it should not be difficult to operate at about this speed by careful selection of the right gear, and varying the speed of the engine.

Acknowledgments.

Acknowledgments are due to Mr. L. Judd, Executive Officer, Farm Mechanisation Scheme, and members of his staff for their assistance and helpful suggestions given during preparation of this article.

THE EFFECT OF MOLYBDENUM ON CLOVER GROWTH

On Laterite Soils.

N. H. PARBERY, D.Sc.Agr., Analyst.

IT has been shown in a previous article* that base replenishment is a primary requisite of any programme of fertility improvement in the red laterite soils. The use of any agent, whether plant or chemical, which gives a promise of circumventing this fundamental feature is, in the ultimate, retrograde—a form of soil exploitation which would soon induce in deteriorated soils a level of nutrition incapable of supporting any useful form of vegetation. Soils in which the major mineral nutrients have been reduced to mere subsistence level for low fertility tolerant species cannot longer support an accelerated outgo of those minerals. The success achieved in South Australia in greatly enhancing pasture growth by the application of minute amounts of molybdenum should not be regarded by farmers on the brown and red laterites as inspirational, while their mineral-mined lands remain un-phosphated, over-acid and under-limed.

IN an experiment conducted in 1945 to determine the effect of molybdenum on clover growth, the soils used comprised four laterites—a brown and two red-brown laterites from Robertson, and a red laterite from Alstonville. The brown laterite A was centrally situated along the northern edge of the basalt flow at Robertson; the red-brown laterite B was taken from the southern fringe and the red-brown laterite C from the eastern edge. The soils along the southern and eastern edges of the Robertson flow are more acid, deficient in bases and more highly laterised than the central and north-western portions, in which direction rainfall rapidly diminishes.

The Alstonville laterite is representative of the most deteriorated of the Big Scrub soils and rather poorer in bases and more acid than most of the Alstonville soils.

Following details will serve to characterise the soils:—

Soil Features.	Robertson Laterites. A	B	C	Alstonville Laterite.
Exchangeable cations:—	Ways.	Ways.	Ways.	Ways.
Calcium	0·00	0·80	1·33	2·20
Magnesium	2·50	0·40	0·53	1·10
Potassium	0·64	0·41	0·31	0·41
Sodium	2·45	0·48	0·80	0·81
Hydrogen	79·60	47·78	45·34	42·00
Exchange capacity	94·10	49·87	48·31	46·52
Unsaturation (per cent.) ...	84·5	95·8	93·8	90·3
SiO_2/R_2O_3 ratio	1·33	1·16	1·16	0·55
Total P_2O_5 (per cent.) ...	0·54	0·26	0·26	0·73
Available P_2O_5 (p.p.m.) ...	70	17	25	10
Reaction (pH)	5·1	4·5	4·8	4·5
Clay (0·002 mm.) (per cent.) ..	50	58	51	52
Organic matter (per cent.) ...	16·2	8·6	9·8	9·4
Field capacity (per cent. water)	64	41	45	44
Wilting point (per cent. water)	33	20	23	22

The Treatments Given.

The brown laterite A had been used in an experiment during the previous year (1944) and soils other than the control, dolomite only and lime only treatments, had received in that year superphosphate at the rate of 4 cwt. per acre. The other laterites were used for the first time and dolomite or lime had been applied, as indicated, two months prior to planting at the rate of 3 tons per acre 8 inches. Lime or dolomite had been applied to the brown laterite in the earlier experiment at the same rate.

The Robertson soils were planted in April, 1945, with inoculated Mt. Barker Subterranean clover and the Alstonville soil with inoculated White clover. Growth throughout the winter was slow, and the best plants were only a few inches high at the end of July. The Subterranean clover at this period in treatments other than those receiving molybdenum at the rate of 4 ounces per acre, were red in colour and, where not stunted through inadequate nutrition, had much longer stems than the molybdenum-treated plants which were green, with short, dense foliage. As the weather became warmer the red pigment quickly disappeared. The green foliage of the molybdenum treatments appeared to be due to an adequate nitrogen supply resulting from more effective and earlier nodulation; the red condition of the leaves was not related to phosphate supply. Minor elements, where used, consisted of 28 lb. copper sulphate, 28 lb. zinc sulphate and 10 lb. borax per acre. Appropriate amounts of these salts, as well as the molybdenum oxide, were applied in

* June, 1946, issue, page 291.

solution in a plane at 1 inch depth. Superphosphate was applied in a plane at 1 inch depth.

ROBERTSON BROWN LATERITE A.

1. Control.
2. 4 cwt. superphosphate (22% P_2O_5) per acre.
3. 4 cwt. superphosphate + 4 oz. MoO_3.
4. Dolomite, 3 tons per acre 8 inches.
5. Dolomite + 4 cwt. superphosphate.
6. Dolomite + 4 cwt. superphosphate + Mo.
7. Lime ($CaCO_3$), 3 tons per acre 8 inches.
8. Lime + 4 cwt. superphosphate.
9. Lime + 4 cwt. superphosphate + Mo.

ROBERTSON RED-BROWN LATERITES B, C, RESPECTIVELY.

B. C.
10, 16. Control.
11, 17. 4 cwt. superphosphate.
12, 18. 4 cwt. superphosphate + Mo.
13, 19. Dolomite, 3 tons per acre 8 inches.
14, 20. Dolomite + 4 cwt. superphosphate.
15, 21. 4 cwt. superphosphate + Mo + Minor elements.

ALSTONVILLE RED LATERITE.

22. Control.
23. 4 cwt. superphosphate.
24. 4 cwt. superphosphate + Mo + Minor elements.
25. Dolomite, 3 tons per acre 8 inches.
26. Dolomite + 4 cwt. superphosphate.
27. Dolomite + 4 cwt. superphosphate + Mo.

The plants were harvested at flowering in October, about 200 days after sowing. Where superphosphate was applied in the current experiment, phosphate containing 662 milligrammes P_2O_5 was added.

Details of the weight and composition of the clovers and of phosphate recovery are presented in Table I.

TABLE I.—WEIGHT AND COMPOSITION OF CLOVER AND RECOVERY OF PHOSPHATE.

Treatment.	Soil Reaction at End of Experiment.	Weight of Clover.	Soluble Ash in Clover.	P_2O_5 in Clover.	P_2O_5 Absorbed.	Net P_2O_5 Absorbed.	Percentage Recovery of added P_2O_5.
	pH.	gm.	per cent.	per cent.	mgm.	mgm.	
Robertson Brown Laterite, A.							
1. Control	4·8	32·4	8·3	0·28	90·7	...	...
2. 4S	...	48·9	8·9	·40	194·2	103·5	15·6
3. 4S, Mo	...	56·4	8·7	·39	221·0	130·3	19·7
4. Dolomite ...	5·2	43·8	8·0	·27	116·6	...	...
5. D, 4S	...	48·0	9·6	·49	235·2	118·6	17·9
6. D, 4S, Mo ...	...	51·2	9·4	·48	246·1	129·5	19·6
7. Lime	5·0	37·5	8·8	·28	103·1	...	...
8. L, 4S	...	48·5	8·7	·40	192·4	89·3	13·5
9. L, 4S, Mo ...	...	40·0	8·7	·45	181·2	78·1	11·8
Robertson Red-brown Laterite, B.							
10. Control	4·25	2·9	10·3	·31	9·0	...	...
11. 4S	...	12·8	9·1	·48	60·9	51·9	7·8
12. 4S, Mo	...	43·4	7·1	·24	103·3	94·3	14·2
13. Dolomite ...	4·95	20·5	9·2	·26	53·5	...	...
14. D, 4S	...	72·7	7·4	·26	186·8	133·3	20·1
15. 4S, Mo, M ...	...	26·1	6·7	·30	77·3	68·3	10·3
Robertson Red-brown Laterite, C.							
16. Control	4·25	4·6	9·6	·28	12·9	...	...
17. 4S	...	16·8	9·4	·46	76·7	63·8	9·6
18. 4S, Mo	...	47·7	6·9	·22	106·8	93·9	14·2
19. Dolomite ...	4·95	18·0	9·4	·25	44·5	...	...
20. D, 4S	...	70·3	8·3	·24	170·8	126·3	19·1
21. 4S, Mo, M ...	...	42·9	6·6	·23	100·0	87·1	13·2
Alstonville Red Laterite.							
22. Control	4·5	5·0	10·3	·41	20·6	...	...
23. 4S	...	26·5	11·1	·49	129·8	109·2	16·5
24. 4S, Mo, M ...	...	28·2	10·8	·40	113·9	93·3	14·1
25. Dolomite ...	5·6	22·2	10·8	·41	90·1	...	...
26. D, 4S	...	56·8	9·7	·34	193·6	103·5	15·6
27. D, 4S, Mo ...	...	56·4	9·4	·34	193·4	103·3	15·6

The Influence of Dolomite and Lime on the Calcium and Magnesium Content of Clovers.

Table II shows the calcium and magnesium content of the clovers harvested from the variously treated soils.

TABLE II.—CALCIUM AND MAGNESIUM CONTENT OF CLOVERS.

Treatment.	CaO.	MgO.
	per cent.	per cent.
Robertson Brown Laterite, A.		
1. Control ...	2·30	0·35
2. 4S	2·70	·41
3. 4S, Mo ...	2·70	·39
4. Dolomite	2·43	·46
5. D, 4S ...	3·11	·54
6. D, 4S, Mo	2·82	·54
7. Lime ...	2·64	·32
8. L, 4S ..	2·80	·42
9. L, 4S, Mo	3·72	·34
Robertson Red brown Laterite, B.		
10. Control ..	0·87	·30
11. 4S .	1·26	·27
12. 4S, Mo .	1·10	·29
13. Dolomite	1·96	·60
14. D, 4S ...	2·20	·49
Robertson Red brown Laterite, C.		
16. Control ..	0·93	0·27
17. 4S ...	1·41	·40
18. 4S, Mo ...	1·34	·30
19. Dolomite	2·14	·57
20. D, 4S ..	2·32	·48
Alstonville Red Laterite (White Clover).		
22. Control ...	1·78	0·45
23. 4S ..	2·26	·40
24. 4S, Mo, M	2·18	·40
25. Dolomite	2·26	·52
26. D, 4S ...	2·59	·61
27. D, 4S, Mo	2·52	·55

On the better-based brown laterite, the calcium content of Subterranean clover is not greatly influenced by the lime or dolomite treatments. There is a slight rise in magnesium content on the dolomited soil. On the red-brown laterites B and C, the calcium content is at a very low level in all treatments other than the dolomite treatment which greatly augments the magnesium content of the clover.

The calcium demand of White clover grown on the Alstonville red laterite is more definite, growth being limited by the low calcium supply, and there is not the same tolerance of low calcium content exhibited by Subterranean clover on calcium deficient soils. The effect of dolomite is reflected rather in better growth than on the calcium and magnesium content of White clover.

General Discussion.

In the unlimed brown Robertson laterite A, which contains more lime than the other Robertson soils, molybdenum when used in conjunction with 4 cwt. superphosphate (T3) gives an appreciably better yield than the phosphate alone (T2). The addition of molybdenum to the 4 cwt. superphosphate additions on the dolomited and limed soils (T6, 9) does not influence yield.

The growth of Subterranean clover on the untreated red-brown Robertson laterites was very poor and little response in growth resulted from the addition of 4 cwt. superphosphate (T11, 17). The combination of molybdenum with 4 cwt. superphosphate on these soils resulted in greatly increased yields (T12, 18). The addition of dolomite to these soils is more effective in increasing yields than the 4 cwt. superphosphate treatments (T13, 19). In view of the high organic matter content and exchange capacity of the laterites, rather heavy applications of minor elements were made. In treatments 15 and 21 they proved toxic, growth being depressed in the early stages, and satisfactory growth did not begin until late in the season. The effect of molybdenum in conjunction with other minor elements is thus obscured, and a possible effect from molybdenum in treatment 24 is compromised by the presence of the other minor elements.

Outstanding yields were obtained on the red-brown laterites B and C and the Alstonville laterite when 4 cwt. of superphosphate was combined with the dolomite treatment (T14, 20, 26, 27). This result underlines the importance of restoring calcium and possibly magnesium to these soils. In the absence of these bases the effectiveness of superphosphate is at an uneconomic level.

White clover on the untreated Alstonville laterite is a practical failure. The 4 cwt. superphosphate treatment (T23) promotes moderate growth but is little superior to the dolomite (T25) treatment. Identical results were obtained in treatments 26 and 27 showing that the addition of molybdenum in the latter treatment produces no better results than the combination of 4 cwt. superphosphate and 3 tons dolomite per acre.

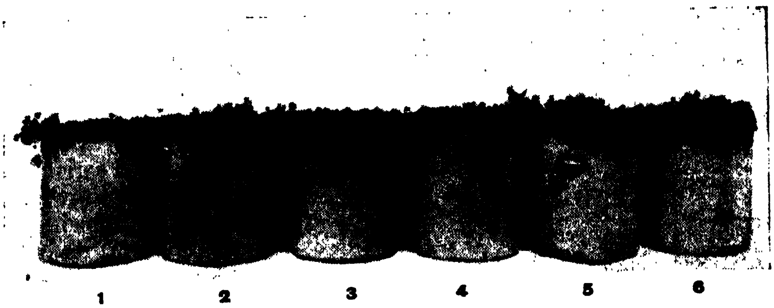
It has been demonstrated previously that a considerable stimulation of grass growth and clover can be maintained over some years by the addition of dolomite alone to the red laterite at Wollongbar which is situated a few miles distant from the Alstonville laterite used in this experiment. This fact taken in conjunction with the results obtained with clovers demonstrates the necessity in any long-term project of pasture improvement of amply reprovisioning the soil with those bases which were once present in many times the vestigial quantity

which now survives climatic wastage and human exploitation.

The impressive increases in clover growth on the most acid and base-impoverished Robertson soils, through the addition of molybdenum, may be misconstrued to suggest that an increase in the productive capacity can be cheaply effected. Such an interpretation, however, loses sight of the fact that increased production on these soils through such an agency represents the final phase of soil exploitation. It affords the means of extracting the last of the magnesium and calcium which can be used by

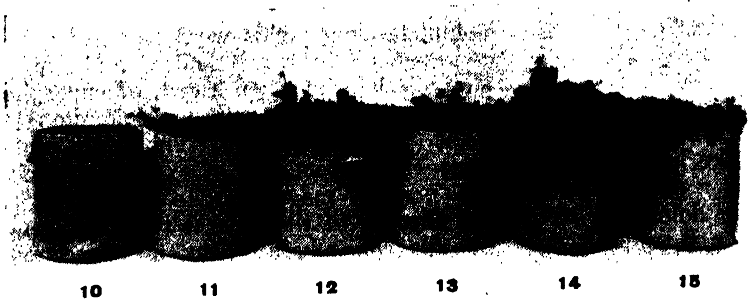
Subterranean Clover on Robertson Brown Laterite, A.

1.—Control.
2.—4S.
3.—4S, Mo.
4.—Dolomite.
5.—D 4S.
6.—D, 4S, Mo.



Subterranean Clover on Robertson Red-brown Laterite, B.

10.—Control.
11.—4S.
12.—4S. Mo.
13.—Dolomite.
14.—D, 4S.
15.—4S. Mo, M.

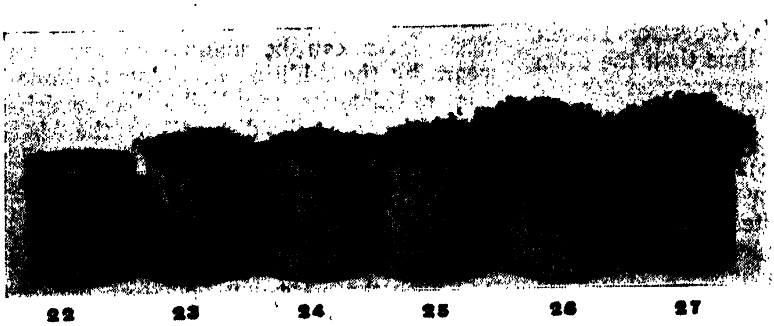


Subterranean Clover on Robertson Red-browh Laterite, C.

16.—Control.
17.—4S.
18.—4S, Mo.
19.—Dolomite.
20.—D, 4S.
21.—4S, Mo, M.

White Clover on Alstonville Red Laterite.

22.—Control.
23.—4S.
24.—4S, Mo, M.
25.—Dolomite.
26.—D, 4S.
27.—D, 4S, Mo.



useful pasture species. The acceleration of lime and magnesium outgo results in the intensification of soil acidity, which is a common enough consequence of stimulating crop growth by many forms of unbalanced fertilising.

The employment of materials in small quantity, which palliate declining soil fertility postpones the inevitable and fundamental necessity of first remedying the major deficiencies of impoverished soils. Pasture management on such soils is unsound, in any event, unless some form of liming is a feature of the programme. If molybdenum is to be used, then it is essential that adequate applications of both phosphate and liming materials should accompany its use.

The recovery of phosphate reaches a maximum of only 20 per cent. of that applied. Where the seeding of clovers and fertilising with superphosphate are carried out coevally, the clovers are at a disadvantage in respect of phosphate nutrition, due to fixation of phosphate by the soil during the slow early developmental stages. When cold conditions further impede growth, the loss of phosphate is intensified. Better recovery of phosphate might be obtained under field conditions where established clovers are topdressed. The slow developmental stages are thus avoided and the plants are sufficiently advanced to make use of the applied phosphate.

Summary.

In keeping with results obtained previously with rye grass on a red laterite soil, the importance of base replacement in laterite soils for the successful growth of Subterranean and White clovers has again been demonstrated.

The application of molybdenum oxide at the rate of 4 ounces per acre to a moderately deteriorated brown laterite from Robertson produced a small increase in the growth of Subterranean clover, but it had no effect in the presence of lime or dolomite.

Molybdenum produced a marked response in clover growth on two deteriorated red-brown laterites from Robertson, but the effect produced was considerably less than the treatments combining phosphate and dolomite.

Substantial increases in the growth of White clover resulted from the application of dolomite and phosphate to a red laterite from Alstonville. Molybdenum in the presence of these materials resulted in no increase of growth.

The exploitative aspects of molybdenum additions to base impoverished soils are stressed, and the use of this agent does not remove the fundamental necessity of remedying the major base deficiencies in the red laterites.

Agricultural Societies' Shows.

SECRETARIES are invited to forward for insertion in this list dates of their forthcoming shows; these should reach the Editor, Department of Agriculture, Box 36A, G.P.O., Sydney, not later than the 15th of the month previous to issue. Alteration of dates should be notified at once.

1946.

Albury Sheep Show (A. G. Young)	August 6, 7
Condobolin (N. J. Hanlin)	August 6, 7
Trundle (W. A. Long)	August 13, 14
Lake Cargelligo	August 13, 14
Gilgandra	August 13, 14
Peak Hill (C. McDowall)	August 20, 21
Weethalle	August 21
Parkes (L. S. Seaborn)	August 26, 27, 28
Grenfell	August 30, 31
Forbes (J. T. Woods)	September 3, 4
Manildra (E. S. Parker)	September 3, 4
Young (T. A. Tester)	September 3, 4
Coolamon (R. G. Lynch)	September 6, 7
Lockhart	September 7
Deniliquin	September 7
Cowra	September 10, 11
Henty	September 10, 11
West Wyalong	September 10, 11
Narromine	September 11, 12
Narrandera (T. L. Bull)	September 13, 14
Bourke	September 14, 15
Temora	September 18, 19
Leeton (E. C. Tweedie)	September 20, 21
Murrumburrah (R. J. Simpson)	September 24, 25
Quandialla	September 25
Eugowra (Miss P. Casey)	September 25
Grafton (C. W. Creighton)	September 26, 27, 28
Ardlethan (E. C. Knight)	September 27
Finley	September 28
Mangrove Mountain Agricultural Bureau (Mrs. Roberts)	September 28
Griffith	October 1, 2
Walbundrie (C. Lieschke)	October 2
Bribbaree	October 2
Singleton	October 3, 4
Albury (A. G. Young)	October 8, 9, 10
Holbrook	October 25, 26
Bangalow	November 12, 13

Growers of Approved Seed Oats.

THE following growers have supplies of approved seed oats for sale. The crops of these growers were inspected by Officers of the Department and reached a standard of purity and truenees to type up to the approved standard.

Growers listed should notify the Department immediately their available seed of any variety is exhausted.

Algerian.—
Wilson, R. & Sons, "Fairview," Oberon.
Dickson, A. S., "Yurunga," Oberon.
Witten, R. A., "Willowbank," Oberon.
Howard, G., "Kallara," Springdale.
Burns, W., Goongirwarrie, Carcoar.

Belar.—
Hall Bros., "Ellerslie," Wallendbeen.
Hill, A. H., "Carawatha," New Molyan, via Mendooran.

Belar—continued
Witten, R. A., "Willowbank," Oberon.
Ward, H. E., "Gwenvale," Parkes.
Cullen Bros., Bunglegumbie, via Dubbo.
Idiens, H., "Kangarooby," Gooloogong.

Brigalow.—
Wilson, R. & Sons, "Fairview," Oberon.
Gardiner, A. K., Claremont, King's Plain, Blayney.

Fulghum.—
Crick, P., "Mayfair," Gollan.

Kurrajong.—
Ward, H. E., "Gwenvale," Parkes.

Approved Seed—May, 1946.

To assist in the production and distribution of approved seed of recommended varieties of crops and vegetables, the Department publishes in this list each month the names and addresses of growers of such seed.

***Cauliflower*—**
Shorts—H. Burton Bradley, Sherwood Farm, Moorland.

Potato—
Certified Factor—Secretary, Blayney District Potato Growers' Association, Box 15, Blayney.

Varieties of Approved Seed Available.

In order that farmers may be directed to what are regarded by the Department as the most satisfactory local sources of approved seed of recommended commercial varieties of farm crops and vegetables, the Department is willing to supply information concerning such sources of seed of the following varieties:—

Tomatoes—
Rouge de Marmande Pearson, Break O'Day.

When to Cut Millet for Hay, Green Feed or Silage.

For hay, green feed or for making into silage, millet should be cut when it is in head and before the grain is well formed, but the stalk sappy and the leaf quite green. It is better to err on the early side rather than to allow the crop to become too advanced. This is particularly so if any considerable area is being made into hay or silage, as the crop ripens so quickly that the quality will rapidly deteriorate if cutting is not commenced early.

The crop is harvested with the mower and rake or reaper and binder. Japanese millet has a rather coarse, pithy stem, and is therefore considerably more difficult to make into hay than wheat or oats, requiring much longer in the stook. Good haymaking weather materially assists in curing, which must be thorough or heating in the stack will occur.

Millet hay is coarse, this coarseness increasing with the lateness of cutting, and is influenced considerably by the thickness of the stand and also by the quality of the soil and weather conditions experienced during growth. Although in quality it is inferior to wheaten and oaten hay, it is nevertheless a very useful fodder to have in reserve. It should be chaffed and fed in conjunction with other hay, such as wheaten, oaten and lucerne, for the best results. The yield of hay varies from 1 to 3 tons per acre in inland districts, and of green fodder from 10 up to 20 tons per acre under favourable weather conditions in coastal districts.

Because of their quick growth, high carrying capacity, duration of the grazing period, high feeding value, and absence of danger from prussic acid poisoning, the chief value of the fodder millets is undoubtedly for grazing—they are the ideal crops to grow in spring and summer for this purpose for all classes of stock.—W. D. KERLE, Special Agricultural Instructor.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TRAVEL BY TRAIN

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NEW HAWKESBURY RIVER BRIDGE.

On the first of this month the new railway bridge over the Hawkesbury River was officially opened for traffic by the Hon. W. J. McKell, M.L.A., Premier and Colonial Treasurer.

This bridge has taken over the task of the old bridge that had carried trains over the Hawkesbury since 1st May, 1889.

Why not give yourself a treat—a train trip over the new bridge? In addition to seeing the new bridge you will see the old bridge only 200 feet downstream and the new road bridge further upstream.

Unforgetable views are to be obtained in the vicinity of Hawkesbury River from railway carriage windows.

Special Excursion tickets (issued every Friday, Saturday, and Sunday and available for return until the following Monday) enable you to travel over the bridge at single fare for the forward and return journeys so long as your trip is within the Tourist Area, which extends from Sydney as far as Nowra, Canberra, Orange, Mudgee, Singleton, and Dungog.

S. R. NICHOLAS,
Secretary for Railways.

THE GROWING OF OATS

ON WHEAT FARMS

Enables Greater Diversification and Conserves Fertility.

(Concluded from page 297.)

CONTRIBUTED BY THE DIVISION OF PLANT INDUSTRY.

THE first section of this article, which appeared in June issue, dealt with the ways in which oats may be used on wheat farms to assist in maintaining the fertility of the soil (by enabling the greater combination of livestock raising with the growing of wheat), and with the special qualifications of oats for this use.

This concluding portion discusses the methods of growing the oat crop on wheat farms.

Climate and Districts.

Oats may be grown with success under a diversity of climatic conditions, thriving better than wheat in a cold climate associated with a good rainfall that is evenly distributed throughout the crop-growing season. In some of the colder districts oats may be grown almost to perfection. In a general way, it can be said that a good potato district will, as a rule, prove suitable for the growing of oats, as these crops require similar conditions of climate. Some of our very best potato districts are situated on the Northern Tablelands, and these areas are also among the best oat districts. Glen Innes, in particular, is a district where the climatic conditions are favourable to the production of potatoes and oats of the highest quality.

The central tablelands, from Blayney to Orange, is the pick of the oat country, although some exceptionally good returns have been obtained in the Bathurst district. On the southern line, the best oat districts are situated in the vicinity of Goulburn, Taralga, and Crookwell, and some excellent crops have been grown in the country between Junee and Albury.

The districts mentioned can be classed as about the best for oat growing, but good crops can be grown in any wheat district by choosing varieties adapted to the local climatic conditions. In districts with a lower average rainfall than 25 inches the short, white oat favoured for oatmeal cannot be grown to perfection.

The Variety Must Suit the District and Purpose of Production.

Satisfactory crops of oats are extremely easy to grow with a little attention to the purpose of production, the selection of the variety, and the preparation of the soil. The field technique to be employed in production is largely determined by the uses to be made of the oat crop, and these may be (*a*) wholly grazing, (*b*) solely hay or grain, (*c*) dual use, in which early grazing is followed by hay or grain production. The selection of the variety has relation to the location of growth and the uses of the crop.

Selecting the Varieties.

The tablelands and the higher portions of the slopes areas are suited to the growing of late-maturing types such as Algerian, and in these districts this variety is unsurpassed, irrespective of the product required. Algerian is outstanding as a crop for continuous and complete grazing, and also produces good yields of excellent hay and high quality grain.

The variety Guyra performs well within the Bathurst-Orange zones, and White Tartarian is a useful sort for spring sowing on the Northern Tableland. Should a faster-growing variety for grazing be required, Fulghum cannot be bettered.

The western portions of the slopes and also the plain areas are suited to the earlier maturing varieties, although Algerian might prove to be quite useful on portions of the farm area to be sown for grazing purposes only; the standard varieties to sow are Belar and Fulghum. For hay and grain purposes Belar is unsurpassed for both yield and quality, and it is of useful grazing value. Fulghum is the best grazing oat, and although productive as either hay or grain, the quality of these products is not quite the equal of those from the variety Belar.

The very early maturing varieties such as Mulga and Gidgee are suited to the drier

portions of the plain areas should hay or grain be the desired product, but neither should be grazed.

From time to time the recommendations may be altered as new oat varieties are developed or introduced. Each year, usually in January or February an up-to-date list of recommendations is published in the *Agricultural Gazette*. The article is reprinted in leaflet form and may be obtained by application to the Chief, Division of Information and Extension Services, Department of Agriculture, Box 36A, G.P.O. Sydney.

Plan the Areas to be Sown.

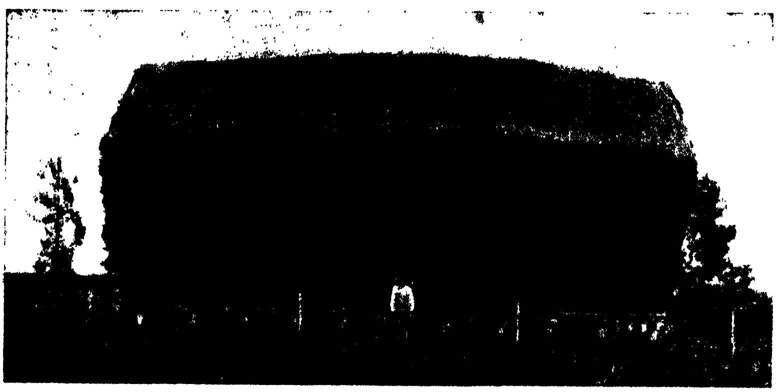
Oats should have a definite place in the rotation upon every wheat farm, and the area sown should bear relationship to the farm requirements and its developmental possibilities. A certain area is annually required to produce the necessary hay, grain and silage to meet the regular farm consumption. Areas of grazing oats will save the natural pastures, and enable them to build up in body and thus become more valuable in subsequent years.

Grazing the Oat Crops.

The practice of grazing the early growth of oats and depending upon the subsequent regrowth for hay and grain production does not entirely meet farm requirements. A poor regrowth following the grazing frequently leaves a shortage in production of hay and grain. A plan worthy of consideration is the sowing of an area entirely for grazing, and comprised of two varieties, such as Fulghum and Algerian. These areas would be grazed right out, and would probably be useful until October or November.

Although there is some evidence to suggest that for grain and hay production, fallowing as for wheat would, in certain districts, be sound practice, it is necessary that oats sown primarily for grazing purposes should be produced as economically as possible, and consequently stubble sowing is universal.

The best results are obtained with such crops by grazing before the crop is too advanced, followed by successive grazings as growth permits, which is usually at intervals of from two to four weeks. By such treatment there is little loss of fodder by trampling and fouling, and the maximum life and productivity of the crop are obtained, as stooling is encouraged rather than the reverse. It will be obvious that this desirable treatment cannot be given where stock are allowed to feed over large areas of crops, and therefore, the use of temporary fencing to divide the grazing oat crop into paddocks of convenient size for rotational grazing is strongly recommended.



A Well-thatched Oaten Hay Stack at Temora Experiment Farm.

Note the straddle for protection against mice and the fence to exclude stock.

A very sound practice adopted by some farmers on heavy soil is the ploughing in of the grazing oat crop late in the season with the idea of improving the soil fertility by the addition of plant remains. Many farmers plough in immediately after grazing when the oats are eaten off almost to the ground level, the last grazing frequently being severe for this purpose. However, there are distinct advantages in letting about 9 inches of growth remain, to be ploughed in and assist in building up organic matter in the soil. If there is a natural trefoil growth present, the nitrogen so added is of further benefit.

In common with other forms of lush growth, green oats are liable to cause nutri-

tional trouble, especially with stock which are unaccustomed to such fodder, and it is therefore an advantage to supply natural pasture in conjunction with the oats, or, if this is unavailable, chaff can be supplied in self-feeders, or, in the case of stock being fattened, oat grain.

Should the hay and grain crops be sown early, light grazings until the end of June would not be very risky, but late July and August grazing are frequently followed by dry conditions, early stem development, and very light yields.

A planned programme of oat crop growing and stock raising will not permit of oat crop failures without serious interference with other activities, and the objective is to reduce such risk to a minimum.

Oat crops for hay or grain need not be sown until the bulk of the wheat seeding is finished, which may well be from mid- to late-May, except for Algerian, for which April seeding is advisable. Heavy, bulky crops of oats are not desirable, as they present many field difficulties and frequently result in waste or the production of hay of poor quality. The mid-May seedings—provided they are not grazed—produce moderate-yielding crops of high quality and are easily harvested and disposed of before the wheat harvest commences.

In the colder parts of the Northern Tableland, particularly in Glen Innes and higher country, it has been found in recent years that, owing largely to the depredations of rabbits, it is advantageous to sow oats about August or early September. Sown then the crop comes along at a time when grass is becoming plentiful, and when the oats are not, therefore, so liable to the particular attentions of the rabbits. Because he is able to sow oats this late, the farmer finds it a very suitable crop to follow maize, ample time being available to prepare the land after the maize is off. For such sowings the variety must be selected with care. The most suitable is White Tartarian. Algerian and similar sorts are liable to run to head too quickly. If sown before this August-September period and the weather conditions are very favourable to growth, the oats may grow too rank, and are then apt to lodge, unless the growth is checked by feeding-off. Where sheep are of more importance to the grower than his grain crop, February sowing of Algerian oats for feeding off may be quite justified.

Harvesting an Oat Crop for Grain.

When to Sow.

Oat crops for grazing entirely or for early grazing and a subsequent regrowth for crop production may be sown in early autumn. Provided subsoils are wet and surface soil moisture is sufficient for germination, mid-March sowings are quite safe. Within portions of the State which are frequently favoured with summer rains, such as the north-western districts, February sowings may also be successful. The earlier the establishment of the oats the greater will be their autumn and winter grazing value, but sowings may continue until the end of autumn for spring grazing.

Should the regrowth be required for hay or grain, the very early sowing is not advisable as the tendency to early stem development will be pronounced, with consequent risk of head frosting. Such crops are best sown in early April.

From a hay point of view, very early sowing has a tendency to induce a heavy growth of flag, which in wet seasons may turn brown and greatly detract from the quality of the resultant crop.

The Preparation of the Land.

Land intended for oats should be prepared in a similar manner to that intended for wheat, except that in the more favoured oat districts slightly deeper ploughing may prove advantageous. In the drier districts fallowing is essential to obtain the best results, and the time of working and the implements to use are the same as for wheat. Clean cultivation paddocks are essential to the growing of prime oaten hay, as nothing detracts so much from its general appearance when placed on the market as the presence of weeds, thistles, burrs, etc. Incidentally, when oats are grown for green feed on the coast, the land should always be prepared early, say, about two months prior to sowing, provided, of course, the weather conditions will permit. It is wonderful how great is the effect on the resulting crop of a short fallow. A good, moist seed-bed for the reception of the seed is a great aid to success, and every farmer who wishes to obtain the best results with his crop must do all in his power to bring this condition about by careful methods of cultivation before planting.

In wheat districts where the rainfall is fairly good it is a good practice to sow portion of the wheat stubble land with oats for hay. This enables more use of the land than would be the case if it were all fallowed; furthermore, there is a risk of oats lodging badly if the land is fallowed in these districts. An early scarifying or discing of stubble land in February is all that is necessary prior to the sowing of the seed with a combine with trailing harrows attached.

Selection of Seed.

As with all crops, an essential is the selection of a good sample of seed. The grain chosen should be plump, and well cleaned and threshed so that it will run freely through the drill without clogging. The threshing is even more important than grading, for a dirty, half-threshed sample causes patchy and uneven sowing. Oats may be graded with a blower or winnower to separate the light and empty kernels. The latter can be used for feeding stock, and the heavy grains for seed, so as to ensure a uniform, vigorous stand. Where an area not very extensive is to be sown, a good way of preparing a sample of seed that is not too well threshed, *i.e.*, contains too much tail or oats not separated, is as follows:—Put 1 bushel of seed in a bag at a time, choosing hot weather or a warm day; tie the mouth and beat the bag a few seconds with a flail or heavy stick. When sufficient seed has been so treated, put it through a blower or winnower, and a good sample for sowing will result.

Experiments have shown that change of seed is more beneficial with oats than in the case of wheat. It has also been noticed that seed taken from a cool district to a hot one has a tendency to become paler in the colour of the husk; brown oats raised in New England have a darker tint than the same variety raised in the western or Riverina districts. The thickness of the husk varies too with the climate.

In growing oats in the warmer districts it often pays to get the seed from cooler country, the resultant growth being then taller and more vigorous. There is an element of risk in changing seed, however, and unless a grower is sure of his source of supply it is safer to practise plant selection and to raise one's own seed on the farm. An alternative course would be to obtain small supplies of pure seed at regular intervals from one of the Government farms, and to keep the increase as seed for a larger area the following year.

Treatment of the Seed for Smut.

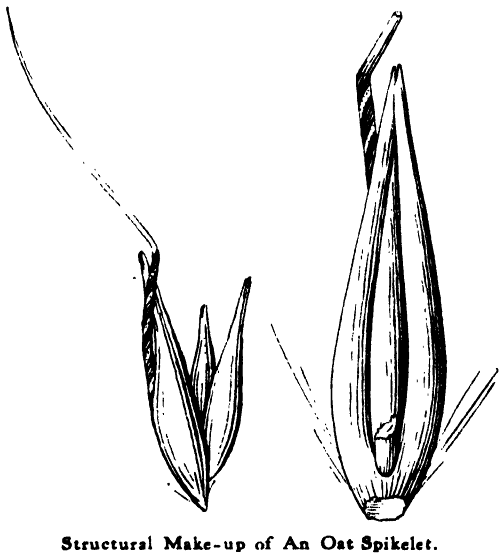
The seed should always be treated to minimise the risk of smut appearing in the crop. Some farmers will argue that a little smut in the hay is of no consequence, but smutty heads always detract from the appearance, reduce the value from a feeding point of view, and if the infection is serious, lower the prices obtained on the market. Cases have been reported where stock have actually refused to eat hay that has been badly smutted, and in any case, yields are impaired by infestation with smut.

The same remarks apply to the grain. Agents will not touch grain that contains smut in any quantity. Methods of prevention must be employed if a clean crop is to be harvested and top market prices obtained.

Seed treatment with copper carbonate is not completely effective in the control of oat smut, apparently because some of the spores are protected by the enclosing husks of the oat grain. The formalin treatment is more effective and should be used, whenever seed is obtained from a somewhat smutty crop. Certain proprietary mercurial dusts, if used regularly, give a practical control. (See Plant Disease Leaflet No. 50, obtainable from the Department.)

Quantity of Seed per Acre.

This depends upon a number of circumstances, the chief among which are the method of sowing (whether broadcast or with the drill) the use to which the crop is to be put (whether for green feed, hay, or grain), the time of sowing, the district, and the habit of the variety (whether it is a scanty or profuse stooler).



Structural Make-up of An Oat Spikelet.
In the single grain at right, note whisker-like *awn*, fibrous *glumes*: and short stalk or *rachil a* by which the next grain of the spike is attached.
In a heavy crop there may be three, four or more grains on each spikelet.

On the coast, where oats are largely grown for green feed, and where the sowing is usually done broadcast, from 2 to 2½ bushels per acre should be sown. If sown too thickly, and heavy rain or showery, windy weather is experienced, the crop is liable to lodge, and as a result it may be partially or totally spoilt before it can be cut. A few farmers on the South Coast have seed drills, and where this method of sowing is adopted the amount of seed can be reduced to half that recommended for broadcasting. No matter what the crop may be intended for, drilling will always give the best results.

For hay on the tablelands, 1½ to 2 bushels per acre is ample when sowing is done with the drill. In the drier wheat districts, 1 to 1¼ bushels per acre is sufficient for a hay crop, provided the variety being sown is not too coarse in the stem. Very coarse-stemmed varieties should always be sown thicker than varieties with comparatively fine stems such as Algerian, as the thicker the sowing the finer the stems will invariably be in the resultant hay. Where the rainfall is sufficient, thick seeding is preferable, especially for hay, as the finer stems make better quality hay and a better sample of chaff. This is a very important point, as there is always considerable waste in feeding hay with coarse stems or chaff that has been cut from coarse-stemmed varieties.

Oats for grain on the tablelands should be sown at the rate of 1 to 1½ bushels per acre, according to the time of sowing and the variety. In the drier districts a bushel to the acre is ample for grain; from 30 to 60 lb. is about the best range for these districts.

Manuring.

Oats, like wheat, require manuring under most conditions, and respond bountifully to the application of superphosphate. On most soils, 56 lb. per acre will be found sufficient, but on poorer lands the quantity can be increased up to ¾ cwt. with beneficial results. When sown early in the season, ½ cwt. of superphosphate is ample, but as the sowing season advances, the quantity can be slightly increased. In coastal districts, where there are practically no drills, and the manure (if used) has to be broadcasted, the quantity per acre should be increased to double that recommended for sowing with the drill. In some experiments conducted by the Department the addition of a little nitrogenous fertiliser in combination with superphosphate has resulted in slightly higher yields.

The Sowing Depth.

Oats take a little more moisture to germinate than wheat, and while 2 inches is a good depth in a moist seed-bed, the seed should be put down 3 inches in a dryish seed-bed, provided the soil is moist at that

depth. If the soil is dry to a depth of 3 or 4 inches it would be wiser to plant 2 inches deep and wait for rain. Although wild oats will come up from a depth of 4 to 5 inches, the plants are not as strong as if they had germinated nearer the surface.

Feeding-off.

Feeding-off oat crops is often a safe practice; it reduces the risk of lodging, lessens the damage from rust should the disease appear, and if done judiciously, will always pay the farmer who has stock. Sunrise and Mulga give a good plump sample of grain after feeding-off in an average season. In most years with early sowing, oats can be fed off three or four times till the end of August; the crop may then be stripped for grain or else eaten off with sheep till the ground is ploughed.

Harvesting Methods.

The mode of harvesting will partly depend on the season, but chiefly on the number of sheep kept by the farmer. If the number is negligible the crop will be cut for hay or stripped for grain and sold off the farm. This, of course, means a drain on the fertility of the soil which will have to be faced sooner or later, as wheat-growers have found to their cost. Where sheep are relied upon for about half the income and wheat for the other half, the crop will probably be grazed once and the oats eventually cut for hay and a portion stripped to provide seed.

Farrer Memorial Scholarship.

Awarded to Mr. F. L. Milthorpe.

THE Trustees of the Farrer Memorial Trust have decided to award the Farrer Memorial Scholarship this year to Mr. F. L. Milthorpe, who is at present Commonwealth Research Fellow in Plant Physiology at the University of Sydney.

Mr. Milthorpe graduated with first-class honours in Agricultural Science at Sydney University in 1940 and was awarded the degree of Master of Science in Agriculture this year. Until recently he was Plant Pathologist with the New South Wales Department of Agriculture, where he was engaged on studies in "dieback on deciduous fruit trees." He was also Walter and Eliza Hall Agricultural Fellow of the University of Sydney during 1940-1942, when he investigated the growth and mineral nutrition of flax.

Under the terms of the Farrer Memorial Scholarship Mr. Milthorpe will proceed to London University later in the year to study under Professor F. G. Gregory. He will investigate problems of drought and frost resistance, particularly in relation to wheat plants. This work will be of the utmost importance to Australian agriculture, especially in the breeding of new varieties.

Pneumonia in Pigs—A Seasonable Reminder.

THE first cold snap heralding winter is frequently followed by outbreaks of pneumonia in pigs, yet this disease is largely preventable. Its occurrence is essentially a criticism of the conditions under which the animals are kept.

The disease occurs in all the pig-raising districts of New South Wales, and is a cause of continual loss to farmers. Few piggeries can be visited without some indication of the presence of pneumonia being seen, and examination of the lungs of pigs killed at abattoirs and bacon factories has shown that as many as 70 per cent. of the lungs seen were affected with pneumonia.

Contagious swine pneumonia is an infectious disease of pigs which is characterised by inflammation of the lungs and pleurae (the membranes lining the chest cavity and covering the lungs). It is caused by bacteria which invade the lung. Frequently other bacteria then attack the invaded tissues and assist in producing ill-health. This is often the case in animals which have made a partial recovery and have passed to the chronic form of the disease. The causal organism may frequently be present in small lesions in the lungs of apparently healthy pigs. No harm appears to be caused by its presence there until the animal is subjected to unfavourable conditions which lower the body vitality and resistance to disease.

These unfavourable conditions, which are called predisposing causes, are associated with faulty management, and include—

(a) Damp, low-lying situations for piggeries and yards.

(b) Inadequate shelter and consequent exposure to inclement weather.

(c) Damp, cold floorings in sties.

(d) Inadequate diet.

(e) Prolonged transport in draughty trucks.

Contagious pneumonia is scheduled under the Stock Diseases Act, and it is incumbent upon the owner to notify the district stock inspector when an outbreak occurs among his stock.

The symptoms of the disease and the measures necessary for control are described in detail in the departmental pamphlet from which the foregoing information is taken. It is obtainable free on application to the Division of Information and Extension Services, Department of Agriculture, Box 36A, G.P.O., Sydney.

INSECT PESTS.

Notes contributed by the Entomological branch

Pests of Carrots.

AMONG the most important pests of carrots are the carrot aphids (Cavariella aegopodii), the vegetable weevil (Listroderes obliquus) and leaf-hoppers (Jassidae).

Carrot Aphids.

The aphids that commonly infest carrots are somewhat small forms in which the winged individuals are greenish, or dark-bodied, and the wingless ones usually yellowish. They feed by piercing the plant cells and sucking up the sap, and when they infest carrots infected with a virus disease they may transmit the infection to healthy plants.

The symptoms typical of their attack are the shrivelling and drying out of the older leaves and bunching of the tops. The foliage also becomes covered with quantities of sticky "honeydew" excreted by the aphids, and this is followed by the development of a sooty mould. A yellowish or reddish colouration of the foliage is often evident, but this may also occur on aphid-free plants during the colder weather.

Late-sown carrots (after about mid-February) are much more liable to injurious infestations of aphids than earlier-sown crops, as growth in late crops is slow, and aphid development is at its peak during July to September. Early-sown crops, usually, have made their greatest growth before severe infestations occur.

There is a very marked varietal susceptibility to aphid infestation. Whilst the Chantenay is very susceptible, the varieties Manchester Table and Osborne, although they may become infested, are usually less susceptible and also are not injured to the same extent.

Control.

Control may be obtained by spraying with a nicotine sulphate solution or by dusting with nicotine dust.

The Spray.

Nicotine sulphate	1 fluid oz.
Soap	2 oz.
Water	4 gallons

The Dust.

Nicotine dust	2½ per cent.

The nicotine dust may be obtained ready for use or may be prepared by mixing thoroughly 1 lb. of nicotine sulphate with 16 lb. of hydrated lime. Some form of revolving container is necessary when quantities of the dust have to be prepared, and several rounded stones placed in the container will assist in the mixing. The nicotine solution should be added slowly while mixing.

Combined Spray or Dust.

Where both vegetable weevils and aphids, or vegetable weevils and leaf-hoppers are also attacking the plants, a combined spray or dust may be used.

The Spray.

Nicotine sulphate	2 fluid oz.
Lead arsenate powder ..	4 oz.
*Bordeaux mixture (1:1:20)	5 gallons

The Dust.

Arsenate of lead powder	1 lb.
Hydrated lime	4 lb.
Nicotine sulphate	5½ fluid oz.

Proprietary dusts containing arsenate of lead and nicotine sulphate are obtainable ready mixed.

* The method of preparing Bordeaux mixture is given in Spray Leaflet No. 1, which may be obtained on application to the Chief, Division of Information and Extension Services, Department of Agriculture, Box 36A, G.P.O., Sydney.

In recent experiments dusts and sprays containing D.D.T. have shown promising results in the control of these aphids. A spray containing 0.1 per cent. D.D.T. (in solvent naphtha-wetsit) appeared to be the most outstanding.

The Vegetable Weevil.

BOTH the larvae and adults of this weevil may attack carrots and cause serious loss if control measures are neglected. In addition to feeding on the foliage or eating away the stalks and new growths of the crowns of the plants, they may attack the carrots below the ground and destroy them.

The larvae and adults feed at night, but the larvae may also feed during the day. Where it is observed that damage is occurring, a search below the soil surface around the bases of the plants during the day, will usually reveal the adults and larvae hiding there.

The greenish-coloured, legless larvae, usually first appear about three or four weeks after the autumn rains, and after feeding for about four to six weeks make their way into the soil where they enter the pupal or chrysalis stage in small earthen cells. The adults, which develop from these, generally commence to emerge from the soil about August, and, after feeding on the plants until about the end of November, they enter the soil and remain there, inactive, until the cool autumn weather commences. They then emerge again and begin to lay their eggs. Egg-laying continues throughout the winter.

Control.

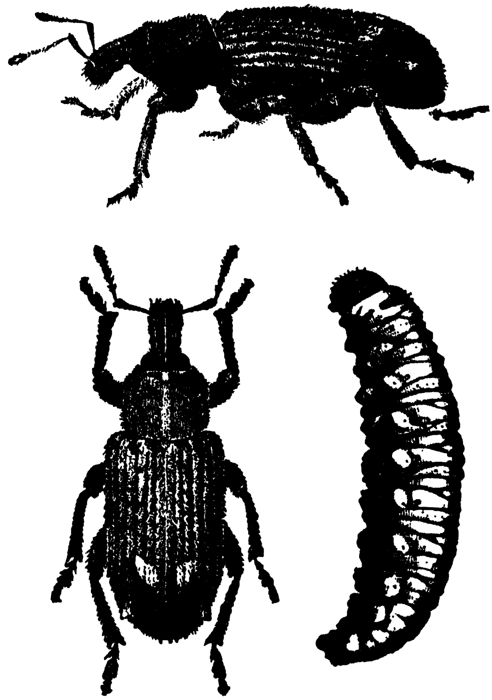
Clean cultivation is an important factor in vegetable weevil control. It must be remembered, however, that the destruction of weeds late in the season may cause the weevils to migrate to cultivated crops, so that, as a precautionary measure, any ground that has been infested, or is thought to have been, should be baited with either poisoned foliage or poisoned bran mash.

The poisoned bait consists of chopped leaves of Cape weed, marsh mallow, etc., which have been either sprayed or dusted with arsenate of lead. The formula for the poison bran bait is as follows:—

Bran	24 lb.
Paris green	1 lb.
Salt	8 oz.
Water	2½ gallons

The bran and Paris green should be thoroughly mixed together first and then made into a crumbly mash with the water in which the salt has been dissolved.

The poisoned foliage may be scattered over the ground late in the afternoon. The poisoned bran may be lightly broadcast over the area or partly worked into the soil, preferably in the late afternoon.



Adults and Larva of the Vegetable Weevil.

With a crop such as carrots, *the foliage of which is not used as food*, control may be obtained by spraying or dusting with arsenate of lead.

The Spray.

Lead arsenate powder	4 oz.
Water	5 gallons

The Dust.

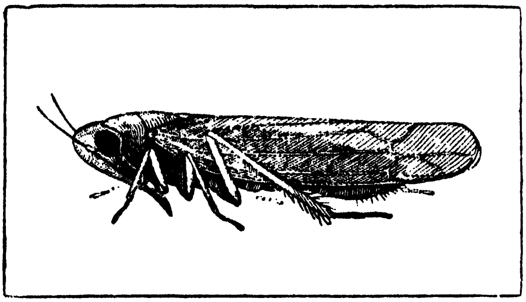
Lead arsenate powder	1 lb.
Kaolin	4 lb.

Where both aphids and leaf-hoppers are also present on the plants the combined spray (nicotine, lead arsenate and Bordeaux mixture) described on page 355 in connection with the control of carrot aphids may be used.

Leaf-Hoppers.

LEAF-HOPPERS are small, yellowish-green insects which feed by piercing the plant tissues and sucking up the sap. Their hind legs are formed for jumping, and in their adult stage they possess two pairs of wings and are able both to hop and fly.

Leaf-hoppers develop upon various weeds and other plants, in addition to carrots, and so may migrate from these to areas under cultivation.



The Adult of a Leaf-hopper or Jassid.

Control.

A combined nicotine sulphate and Bordeaux mixture spray may be used to control them. The formula for this contact spray is:—

Nicotine sulphate .. .. 2 fluid oz.
Bordeaux mixture (1:1:20)... 5 gallons

If aphids are also present this spray will also control them, but where vegetable weevils too are present, it will be necessary to add lead arsenate to the mixture as described for carrot aphids.

Bordeaux mixture applied at a concentration of 1:1:20 will prevent the leaf-hoppers from breeding. A second application may be necessary three to four weeks after the first.

Dusts and sprays containing D.D.T. have shown promising results in controlling leaf-hoppers on tomatoes and may also give the same results against leaf-hcopers on carrots.

Minor Elements and Agricultural Practice.

THE significance of the minor or trace elements in plant and animal nutrition is becoming increasingly evident. Among the more important of the minor elements recognised as essential for plant growth and development are iron, boron, copper, manganese, zinc, cobalt and molybdenum.

It is necessary, however, that the agriculturist view this subject in its true perspective. Relatively minute quantities of these elements are required, and in most soils they occur in sufficient amounts to meet ordinary crop demands. Before assuming that a particular plant trouble is due to a deficiency of some minor element, it is advisable to make sure that all the ordinary requirements for normal crop growth such as good drainage, satisfactory texture, optimum soil reaction and a sufficiency of the ordinary manurial constituents (nitrogen, phosphorus and potassium) are adequately met.

Random applications on a large scale of such substances as borax (sodium borate), bluestone (copper sulphate) and iron, manganese or zinc compounds to a soil without some definite indication or knowledge of a minor element defficiency may permanently reduce the fertility of the soil by the over-application of chemicals which, above certain concentrations, are definitely harmful. The best plan, if a deficiency is suspected, is to try an application of the compound thought to be lacking on a small area of land and note the response. Valuable results have been obtained by growers by the adoption of this course.—CHIEF CHEMIST.

Ten Points for Success in Vegetable Production.

1. Prepare the land thoroughly, and do not plant more than can be managed.

2. Use the best quality seed available, and only proved varieties. Always consider market requirements when selecting varieties.

3. Adopt early control measure for weeds, insect pests and diseases.

4. Crop rotation maintains soil fertility and helps to control weeds, pests and diseases.

5. Seed of cabbages, cauliflowers, tomatoes, celery and onions should not be broadcast in the seed bed, but should be sown in rows 4-6 inches apart.

6. Seeds and fertilisers should not be sown together, as faulty germination often results from fertiliser injury. Peas and beans are very liable to be injured in this way.

7. Irrigation is a big advantage in all districts.

8. Protection from wind injury is very desirable.

9. Grade all vegetables and market them in an attractive way.

10. The addition of animal manures to the soil is recommended under most conditions. The sowing of legumes for green manure is also desirable, especially where soils are deficient in nitrogen and organic matter.

Recommendations for the—

CONTROL OF PESTS AND DISEASES OF TOMATOES.

COMPILED BY OFFICERS OF THE BIOLOGY AND ENTOMOLOGY BRANCHES.

Seed Disinfection.

GROWERS are advised, as far as possible, to save their own seed from selected healthy plants, and to be reluctant about introducing new lots of seed unless there is good reason. If seed is purchased it should be soaked in a 0.6 per cent. solution of acetic acid (1 fluid ounce of glacial acetic acid in 1 gallon of water, or 1 2-3rds fluid ounces of 60 per cent. acetic acid in 1 gallon of water) for 24 hours, to guard against the introduction of the bacterial canker disease. After drying thoroughly it may be treated by dusting (as indicated below) to reduce possible losses from damping-off in the seed-bed.

Even when saved by the grower himself seed should always be dusted before sowing. Dust the seed with copper oxychloride, or a proprietary mercury dust, by shaking the dust and seed together in a lidded container. Copper oxychloride ("Cuprox," "Oxycop," "Smutol") should be used at the rate of one level teaspoon per lb. of seed and the mercury dusts ("Agrosan," "Ceresan," "Semesan") at the rate of one quarter to half a level teaspoon per lb. of seed.

Crop Rotation.

The danger of infection from soil-borne diseases is at a minimum on virgin land. It is unwise to use the same land year after year either for the seed-bed or the crop. The soil for the seed-bed should be from land which has not previouly grown tomatoes and the seed-beds themselves must be well drained. In the case of early crops they should be of the covered type as a protection against saturation of the soil during wet weather.

If land known to be infected with the fusarium wilt organism must be used, the varieties Break O' Day, Marglobe. Prichard, Potentate and Marhio, which are resistant to fusarium wilt. are best suited to such land. Bonny Best. Burwood Prize Chalks Early Jewel, Earliwinner. San Marzano and Walker's Recruit are susceptible to fusarium wilt and should not be planted in infested soil.

Sprays and Dusts.

Successful tomato growing without sprays or dusts is practically impossible; but the various materials all have special uses.

Bordeaux mixture is effective against most above-ground fungous diseases.

Copper oxychloride is sometimes used instead of Bordeaux mixture, but is probably less effective and is more expensive.

Arsenate of lead will poison leaf, stem and fruit chewing insects.

Nicotine sulphate destroys soft-bodied, sucking insects, such as aphids.

Sulphur is effective against mites, and has some value as a fungicide.

Tartar emetic is poisonous to thrips.

IN THE SEED BED.

Treatment of seedlings with fungicides and insecticides is essential for the production of healthy plants; however, as treatments differ somewhat with locality and weather conditions the following sub-divisions may be helpful to individual farmers.

For Coastal and Tablelands Districts.

Treatment should commence as soon as the first true leaves appear, and further applications should be made at intervals of ten days. The spray to use is Bordeaux mixture 2:2:40 (*see* Department of Agriculture Spray Leaflet No. 1).

To the last two applications of spray in the seed bed add 1 lb. colloidal sulphur or 3 lb. wettable sulphur to every 40 gallons of Bordeaux mixture.

Growers who prefer sulphur dust to sulphur spray should omit the sulphur from the Bordeaux mixture and apply a dust, prepared by mixing equal parts of sulphur and hydrated lime. after the Bordeaux mixture has dried. As sulphur dust may injure seedlings during hot weather. dusting should be avoided during such periods or, if the hot period is prolonged, light dustings only should be applied.

For Inland Districts.

In dry weather there is no need to use Bordeaux mixture in the seed bed, but

it is desirable to dust with a mixture of equal parts of sulphur and hydrated lime a fortnight before planting out the seedlings. Heavy dustings may be used during normal weather, but light dustings only should be applied during hot weather or injury to the plants may occur.

In showery weather follow the coastal and tablelands recommendation by using Bordeaux mixture 2:2:40 every ten days. To the last two sprays before transplanting, 1 lb. colloidal sulphur or 3 lb. wettable sulphur should be added to each 40 gallons of Bordeaux mixture.

If sulphur dust is preferred to sulphur spray, the sulphur may be omitted from the Bordeaux mixture and a dust consisting of equal parts of sulphur and hydrated lime may be used. In hot periods light dressings only should be applied, while in normal periods heavier applications should be given.

AFTER TRANSPLANTING.

For Coastal and Tablelands Districts.

EARLY AND LATE CROPS.

When the plants have recovered after transplanting they should be sprayed every week with Bordeaux mixture 1:1:40, plus 3 lb. arsenate of lead to every 40 gallons of spray.

Every second week 1 lb. colloidal or 3 lb. of wettable sulphur should be added to the Bordeaux-arsenate mixture.

Sometimes where grub infestation is heavy it is necessary to dust, between sprayings, with a dust prepared by mixing one part of lead arsenate with two parts of kaolin.

Also, when aphids appear, it is necessary to add 16 fluid ounces of nicotine sulphate to each 40 gallons of spray and to continue this treatment until the aphids disappear.

In wet weather, particularly when humid cloudy days occur, the strength of the Bordeaux mixture should be increased to 2:2:40, and, with late crops, after the fruit has all set, 4:4:40 may be necessary to control "target spot or early blight."

MID-SEASON CROPS.

In wet seasons, give the treatment recommended for early and late crops.

In dry weather, spraying is unnecessary, unless leaf spots begin to appear, but Bordeaux mixture 2:2:40 should be applied at the first sign of these diseases, and the spray should be repeated at weekly or fortnightly intervals thereafter.

Even where spray is unnecessary the following dust should be used every second week:—

3 parts of sulphur.
2 parts of kaolin.
3 parts of arsenate of lead.

For Inland Districts.

EARLY CROPS.

These require the treatment recommended for early and late crops in the coastal and tableland districts.

MID-SEASON CROPS.

In wet seasons these should be treated as for early crops.

In dry seasons, as soon as the plants have become established after transplanting, dust with a mixture of one part sulphur, one part kaolin or hydrated lime at intervals of two or three weeks, but when flowering commences, change the formula to:

3 parts of sulphur.
2 parts of kaolin.
3 parts of arsenate of lead

and apply at intervals of two weeks.

Control of Virus Disease.

(For all districts.)

The virus disease known as "big bud" is carried by leaf-hoppers (jassids) which migrate into the crop from headland and roadside weeds, and no control measures are known at present.

In the neighbourhood of cities and towns, "bronze or spotted wilt" is usually important, particularly in the early or spring crop. A special spray needs to be applied against this disease in addition to the combined sprays or dusts mentioned earlier. From the early seed-bed stage onwards a bait (for the thrips that carry the bronze wilt virus) consisting of—

1 oz. tartar emetic,
4 oz. sugar,
4 gallons water,

should be applied as a fine mist each week.

The tartar emetic bait should be applied after other sprays have dried and be renewed after rain, since it is easily washed off the plant.

To prepare small quantities of the spray, dissolve 1 oz. of tartar emetic in 1 quart of water, and bottle. Take 2 fluid oz. (one-quarter cup) of the bottled solution, and 1½ pints of water and stir in 1 heaped teaspoonful of sugar. Prepare a fresh dilution each time the bait is required.

For economy in the use of the bait in the field, ordinary spray equipment should be modified by fitting a nozzle with a very small aperture. A thorough coverage of the whole of the upper surface of the plants should be the objective at each application. When large quantities of the tartar emetic bait are being used, be sure the chemical is thoroughly dissolved before using.

Other Control Measures.

Sprays and dusts do not constitute a complete measure of control of diseases and pests in any crop. Plants which are not vigorous or which show any symptoms of disease in the seed-bed should never be transplanted.

Rogueing is also highly desirable when certain diseases such as mosaic, streak, bacterial wilt or bacterial canker make their appearance. These diseases are readily carried from plant to plant, especially when pruning is practised, and it is recommended that any plants affected by these troubles should be immediately pulled out and burnt. If the grower is suspicious, but not certain, that any of these diseases is present on a plant it should not be pruned until all healthy plants have received attention.

Another desirable practice is the removal and burning of all plants immediately harvesting is completed. This precaution results in the destruction of all parasites and helps to minimise carry over of diseases and insect pests from season to season.

Minister for Agriculture Visits New Zealand.

DURING his recent visit to New Zealand, in connection with the development of reciprocal trade between that country and Australia, the Hon. E. H. Graham, M.L.A., Minister for Agriculture, made some interesting observations on New Zealand farming methods.

It was obvious to him, said the Minister during his tour of the North Island, that the principal difference between New Zealand and Australian conditions was in the abundant rainfall throughout all parts of the Dominion. Good farming, however, had also been needed to produce such results as had been achieved on one farm he had visited where 6,000 sheep and lambs and 150 head of cattle were taken off a 357-acre property each year, in addition to a harvest of certified grass seed. He had been greatly impressed also by the highly efficient methods adopted by farmers in the districts he had passed through, particularly in the methods they have adopted for carrying their stock through the severe winters that are experienced. On one property he had seen a crop of four and a half acres of mangolds which were sufficient to carry 1,500 ewes through the winter, with the addition of only a small quantity of other feed to balance the ration. He had noticed that on all farms it was the customary practice to conserve fodder or grow special crops to provide for this winter period, and fodder conservation was also practised on a wide scale to guard against the dry spells that do occur, even though infrequently.

The high standard of New Zealand's stock, said Mr. Graham, was very evident, and he had seen some very fine studs of sheep, cattle and pigs. He said the production of butterfat per cow in New Zealand had astounded him and was a tribute to its dairy-farmers, but, the good rainfall and lush pastures which last for such an extended period of the year had, of course, a material bearing on this high production.

Decentralised stock killing in New Zealand was a wonderful thing for the stock industries. In most cases the stock were drawn to these works from within such a short radius that they were killed within twenty-four hours of leaving their home pastures. He had been impressed, said the Minister, with the organisation around each works, as a result of which only the numbers of lambs sufficient to meet the works' killing capacity were submitted for killing each day so that very little holding of stock was necessary. He had seen some very fine lay-outs of works which would be of considerable assistance in the economical handling of stock, and he was taking back to Australia plans of certain features which he had seen in his inspections.

Mr. Graham said that the outstanding feature he had noticed in regard to farm management was the rotational grazing in small paddocks. This, of course, was only possible because of the abundant rainfall which enabled paddocks to recuperate quickly after being severely grazed off, and it certainly achieved wonderful results.

COOL STORAGE OF APPLES AND PEARS.

Long Storage Varieties Should Have Preference.

E. C. WHITTAKER, Fruit Instructor.

THE past season in New South Wales has been characterised by heavy apple crops, light to medium pear crops and a variable rainfall. In most areas the autumn rainfall has been adequate for the needs of the fruit crop, but in some districts it has been more than adequate, and may possibly affect the storage quality of both apples and pears. To this potential source of trouble must be added the effects of harvesting too late in some cases, and more important still, of delay in cool storing occasioned by the congestion at nearly all stores, owing to the heavy crop.

The midseason varieties of apples, such as Jonathan and Delicious, and all pear varieties, are particularly susceptible to physiological disorders in cool store, especially breakdown due to over-maturity, and to various fungal rots following skin punctures—and the incidence of such troubles is always increased in flush seasons with much rain just prior to harvesting.

The congestion at cool stores in some areas has made it very difficult to store fruit immediately after picking, as should be done in the case of practically all varieties of apples and pears—except Granny Smith and to a lesser extent Democrat—if the best results are to be obtained. Prompt cooling after picking is one of the most important factors bearing on the length of possible cool storage period, and in this respect it is interesting to note that experiments have shown that in the case of Delicious, one week's delayed storage at atmospheric temperatures will ripen them more than two months at a cool store temperature of 31-32 deg. Fahr. This may not hold good for all varieties, but nevertheless is a good indication of what does happen in the case of any interruption with prompt cooling after harvesting.

The heavy crop, and insufficient or inefficient labour for harvesting have resulted in some areas in portion of the crop, particularly midseason varieties, being picked sometimes well after the correct stage for storage. Such fruit should be marketed as quickly as possible, as it is only suitable for short storage at the best, and by occupying cool room space is detrimental to the keeping quality of the more valuable later varieties.

In the case of the late varieties intended for long period storage and marketing during the September-December period, it is even more important that every effort be made to place the fruit in store at the correct stage, and although as stated previously, a short common storage period will not affect Granny Smiths or Democrats to any great extent, such storage can prove very detrimental if unduly prolonged. The fact should be kept in mind that towards the latter end of the year high prices are expected by the growers, but if the consumer is to pay these high prices and keep on paying them, he is entitled to an article in prime condition and not, as he frequently receives, one definitely on the down-grade as regards dessert quality.

In past years the condition of much of the cool stored fruit arriving on the Sydney market during this period has left a good deal to be desired—various disorders such as scalds, lenticel spot, stem-end and calyx rots and internal breakdown are altogether too common. Very often these defects do not show up to any extent until several days after the fruit has been removed from the cool store, that is until it is in the hands of the retailer or consumer.

Obviously, then, in a season such as this when there is a heavy crop of the late-keeping varieties, which are the most valuable, they should have preference over other sorts of less value insofar as cool room space is concerned. Every effort should be made to see that the best range of sizes and grades of our best long storage varieties are placed in store at the correct time. It is the height of folly to allow such fruit to stand in common storage too long, merely because the necessary space is occupied by second-rate varieties, short storage fruit or low grade fruit.

New Methods and an Old Menace.

Bulldozers Can Help to Control Armillaria.

K. D. McGILLIVRAY, Fruit Instructor.

NEW methods of clearing land with bulldozers and rippers have not lessened the importance of thorough clearing in the citrus grower's fight against an old enemy—the Armillaria fungus.

In some parts of the Gosford-Wyong-Mangrove Mountain district many blocks are being cleared with the new machines for citrus planting. If properly used this equipment is capable of doing a good job of taking out the roots and stumps of the native trees, a source of infection of citrus trees. If done without great care, solid

pieces of root may be left in the soil to provide a perennial menace to citrus trees.

There is No Substitute for Thorough Clearing.

Observations made recently show that Armillaria grows freely on the dead roots of many native trees such as bloodwood, stringybark, peppermint, red gum and red mahogany.

The greatest danger is from the deep-rooting types with solid tap roots and hard, slow-rotting wood. Armillaria has been seen on roots, in light sandy soil at a depth of 4 feet 6 inches.

The value of an extra ripping should not be assessed in terms of the number of roots that come up from the ripper. If the ripper finds only a few solid roots or portions of solid root the job is well worth while.

Armillaria Travels in Sandy Soil.

The fungus travels through the soil by means of bootlace-like black strands. Conditions for its extension are particularly favourable in deep sandy soils.

The bark of the citrus root is entered and the fungus fans out as a white sheet over the wood surface. The wood is affected and a watery white rot is produced. The rotted wood, fresh and moist from the soil, has a characteristic mushroom smell.

The fungus produces yellowish or honey-coloured toadstools in masses from affected roots or around the butts of dead trees in damp weather. Spores from the toadstools are of no consequence. The black strands appear to be the only means of infection of orchard trees under Australian conditions.

The above-ground symptoms are familiar to most citrus growers. The affected tree thins out its leaves, yellows, often sets a heavy crop and dies limb by limb.

The Disadvantages of Planting Out Dormant Buds.

J. A. HOLBECHE, Fruit Instructor.

USUALLY a few plantings of dormant buds are made each year, but since trees have been in short supply there has been a marked increase in the number of growers adopting this practice.

Frequently such plantings are made with the idea that trees will become established sooner from the dormant buds than if left in the nursery for another year. This, however, is a fallacy; such buds do not produce trees quicker than if the plants remained in the nursery, while the grower has to contend with all the disadvantages associated with caring for the trees in the orchard while they are being developed.

The purpose of this note is to call growers' attention to the many disadvantages associated with the practice.

The term "dormant bud" is used to describe the bud of a desired variety which has been inserted in the stock during the summer, and is planted out the following winter before it commences growth—instead of being kept in the nursery to start growth in the spring and develop into the yearling tree one usually purchases to plant out the following winter.

Dormant buds require special attention from the time growth commences in the spring until growth finishes in autumn, and this can best be given in the nursery by an experienced nurseryman. The following list of operations carried out in the nursery during the season gives some idea of the special care required to raise the yearling tree from a dormant bud:—

1. Removal of the stock above the bud.
2. Frequent inspections to watch for pests and diseases, and control of these troubles.
3. Regular disbudding of the stock.
4. Training the young shoot, disbudding, tying and tipping, etc.
5. Regular watering when required.
6. Culling out poor trees.
7. Suppression of weed growth.

When dormant buds are planted out in orchard formation by growers, they may fail to develop satisfactorily because one or more of the above operations has been neglected, and under extreme conditions there may be heavy losses. Some of the

most common causes of failure are listed below.

1. The young growth from the bud is blown off—this is a real danger when buds are planted out in open ground and the shoots are not tied up regularly.

2. Buds are destroyed, particularly just after growth commences by insect pests (cutworm, elephant beetle, etc.), and by disease.

3. Lack of moisture—the shortage of moisture may be caused by competition with weeds or by failure to apply water when required.

A further disadvantage of the practice of using dormant buds is that, since all trees developed from the buds are usually retained, the result is often a considerable variation in tree size.

Pineapple Growing.

A Means of Diversification of Sub-tropical Fruit Culture.

(Concluded from page 305.)

H. W. EASTWOOD, H.D.A.,
Special Fruit Instructor.

Pineapple Fruiting.

THIS is the third and concluding portion of an article in which the author has, to date, discussed the possibilities of growing pineapples, in conjunction with bananas or independently, indicated suitable climate and soils, and described methods of soil preparation, planting and cultivation.

In this issue he deals with varieties, with the use of paper mulch, and with harvesting and marketing.

Varieties.

Although there are many varieties of pineapples, the Smooth-leaf Cayenne, Common Queen (or Queen) and Ripley Queen (or Ripley) are principally grown in this State.

The Cayenne is mainly grown for the southern markets, which prefer this variety because of the larger size, more attractive appearance and better carrying and keeping qualities.

The leaves are long and smooth, the upper surface is dark olive green in colour with purplish-red streaks extending the length of the leaf but confined largely to the central portion. Ordinarily, but not always, a few spines may occur near the tips or bases of the leaves, but otherwise the leaf margins should be spineless. The flowers are a light purple or violet in colour, and the matured fruit varies in size, but should average about 6 lb. on well-grown plants. The crown or top is large, and individual fruits weighing up to 12 lb. have been recorded. The shape varies, but the cylindrical type is preferred. Externally the colour of the ripening fruit is normally deep yellow or coppery yellow, with large flat pips. The flesh is firm, close-textured and juicy, and pale yellow in col-

our. Summer fruits are generally sweet and full coloured, in contrast to winter fruits, which are often sub-acid and insipid.

The summer crop matures chiefly from February to April, and the winter crop from July to September. Intermediate crops may be harvested in between the two main crops. This variety does not sucker as freely as the rough varieties, and generally takes twenty-two weeks from flowering to ripening.

The Common Queen is free-growing with a dwarf and compact habit of growth. The leaves are short, broad and stiff, and serrated along the margin. Flowers are blue in colour and the fruit conical to cylindrical in shape, with a deep yellow external colour when fully ripe. The flesh is bright yellow, opaque and porous, but it is firm, crisp and sweet, with a distinctive and very agreeable flavour. The fruit has a medium size crown, prominent pips, and generally ripens in twenty weeks from flowering.

The Ripley Queen is a selection of Common Queen, which it closely resembles in many respects, but it is not as consistent a bearer, having one main crop and several "off crops." It differs chiefly in the colour of the foliage, which is pale green heavily tinted with red, in contrast to the bluish-green foliage of the Common Queen. The shape of the fruit is generally thicker in proportion to its length when compared with the Queen. Ripley fruits have a flatter crown, paler coloured skin and a richer flavour. Both varieties are less juicy than Smooth-leaf Cayenne.

Although both Common Queen and Ripley Queen fruits are inclined to be small, the latter variety averages slightly larger than the former, being from 2 lb. to 5 lb. As the trade in the capital cities does not favour these varieties they are grown for local consumption and country distribution. Both varieties sucker very freely if grown under favourable conditions, and rigorous thinning of the suckers in ratoon crops is necessary to maintain size in the fruit.

Two other varieties grown to a limited extent are McGregor and Alexander. The former is a selection of Common Queen, but it is a larger and better-shaped fruit than either Queen or Ripley. The habit of growth is sturdier, and it is broader-leaved and more vigorous. Well grown fruits average 4½ lb. in weight. Alexander is a selection of Ripley Queen, but this variety is more vigorous and produces larger fruit which is a better shape, being more cylindrical. The skin of the fruit is paler in colour than Ripley, the average size larger and the eating quality superior.

Pineapple Plantation in the Port Macquarie District.

Varieties under trial by the Department are Red and Black Spanish, Commonwealth, Eden No. 1, Pernambuco, Ruby and Bermuda.

The Use of Paper Mulch.

Advantages to be obtained from the use of paper mulch were demonstrated in trials carried out at Wollongbar and Grafton Experiment Farms, and are as follow:—

1.—Larger individual fruits, which give increased yields per acre.

2.—A more vigorous and uniform growth of larger and healthier plants, and earlier crops.

3.—Weeding and row cultivation costs were very substantially reduced.

4.—Moisture is conserved, especially in the surface layer of soil, particularly in dry weather, and consequently plant foods are regularly available to the plants.

5.—Heavy rain is prevented from compacting the soil around the roots of the young plants.

6. The soil is kept friable and warmer during cold weather.

The lighter weight paper mulch now being supplied has the advantage that it will break up in fifteen to eighteen months.

Suckers can be pushed through the paper, but holes will need to be made for gill sprouts or slips. One man can make the holes with a dibble, and the plants are then pushed in by someone else.

Harvesting and Marketing.

Fruit should be picked at the correct stage of maturity, and the outward indications will vary with the time of the year and climatic conditions. Maturity standards are prescribed by regulations, but experience is necessary to decide the exact degree of ripeness to harvest the fruit. If gathered too soon the fruit never develops its full sugar content or its full flavour, and if allowed to become too ripe it loses its peculiar piquant flavour, and becomes flat and insipid.

Pineapple Growing in Paper Mulch.

Paper mulch can only be satisfactorily laid on a suitable surface. The land should be properly prepared for planting by ploughing, cultivating, breaking up all lumps, removing stones, smoothing the soil and slightly levelling the sides of the strips.

The surface is then pegged out at the required intervals and the paper is laid by hand. As the paper is unrolled on the land enough soil is placed on both edges to prevent the wind from tearing it.

Shallow furrows, 2 feet 9 inches apart, can be opened with a light plough to accommodate 3 feet wide paper. There should be a gentle slope from the centre line towards the edges of the paper in order that water may run off quickly. Avoid laying paper mulch on a dry soil and complete planting as soon as possible.

The summer crop should be picked for the southern markets when the fruit is fully developed, the pips are well filled out from base to crown and have a light, pale-green colour, and the base pips show a tinge of yellow. Pineapples maturing during the winter months should be allowed to colour up better and show slight yellowing about the base before they are picked.

The fruit should be severed from the plant with a few inches of stalk, using a heavy sharp knife with a straight blade about 20 inches long and 2 inches wide. Care should be exercised in picking and handling. Any slight bruise or puncture will affect the keeping quality of the fruit and allow diseases to develop in transit. When cut, the fruit should be placed in a basket, not more than two deep, in such a manner that the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Copper Fungicidal Spray.
*PHYOMONE.
Prevents pre-harvest drop.
*SHIRLAN AG.
For Mould and Mildew.
*WINTER WASH "A".
For control of green and black aphis.
*HORTOMONE "A".
Plant Hormones to stimulate root growth of cuttings.
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Wetters and spreaders for all sprays.
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spikes or crown will not penetrate the other fruits. For carting to the packing house, vehicles with springs should be used in order to save the fruit from receiving jars or bruises.

When pines are being unloaded at the packing shed they should also be carefully handled and not dumped out on the floor or tables. During unloading is a convenient time to grade the fruit into the various counts and to stack them top downwards or on their crown. Stacking in this way will permit better drying and easier handling. If pines are wet when picked they should be dried before packing, and if harvested in hot weather cooled before casing. Reduce shed handling to a minimum.

After the fruit has been graded to size and maturity the stump of the stem is reduced to about ¼ of an inch, which protects the base of the pine when packing. Avoid breaking the stump from the fruit. Pineapple grading is determined by selecting particular pines of uniform size required to give certain counts; for example, an eighteen count represents eighteen pineapples of even size in a tropical case. Only fruit of one size and even degree of ripeness should be firmly and carefully packed in each case. Nothing detracts from the appearance of a case so much as fruit of different sizes. Discard all fruit which is malformed, sunburnt, mechanically injured or blemished by pests or diseases.

Pineapples are invariably packed in new, tropical cases. The inside measurements, exclusive of any divisions, of this case are 24¾ inches long by 12 inches wide by 12 inches deep. The number of fruit in a case ranges from ten upwards. Stack packing should be avoided, and woodwool is the best packing material, and looks well. Blady and paspalum grass is unsuitable, as it becomes damp in transit and develops heat. It is best to so pack the case that slight pressure is required to bring the lid into proper position. Pineapple cases should not have a bulge, top and bottom, when nailed down. The number of pineapples in each case might with advantage be stencilled on each end of the case.

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Black Spot Damage in Stored Apples.

FOLLOWING a reasonably dry period in some of our late apple districts, heavy rain occurred prior to and at intervals during the harvesting period. The wet period was conducive to black spot development and growers who did not apply the regular black spot sprays are strongly advised to keep a strict watch on fruit, particularly Granny Smith apples which have been placed in common and cold storage. The black spot fungus will spread rapidly in fruit in store.

BOOK REVIEW

"Chromosome Atlas of Cultivated Plants"; Darlington and Janaki.

THE work constitutes an excellent reference book for all those who need to know the chromosome numbers of plants.

The necessity of extending their observations beyond the macroscopic morphology of the plant into the sphere of genetics has become apparent to systematists in recent years. The knowledge of number and behaviour of the chromosome in any natural group contributes much to a full understanding of the relationships between its constituent elements and thus to a sounder system of classification and nomenclature.

As far as the systematics of Australian plants is concerned, the atlas has little direct application, since by definition it is concerned with cultivated plants, and very few of the world's economic species are endemic in this country. Occasionally one of our wild flowers is listed as of horticultural value, but only five species of Eucalyptus and eight of our Acacia species have their chromosome numbers recorded, and other groups of native economic plants are conspicuous by their absence or by the absence of chromosome counts.

However, the atlas should form a framework on to which Australian geneticists and systematists may build, and the systematics of our native flora must thereby be improved.

[Reviewed from the systematic botanists' point of view by Mrs. A. Lee, Botanist, Botanic Gardens, Sydney.]

Banana Industry Problems.

Need for Better Cultural and Marketing Methods

To Increase Consumption.

H. W. EASTWOOD, H.D.A., Special Fruit Instructor.

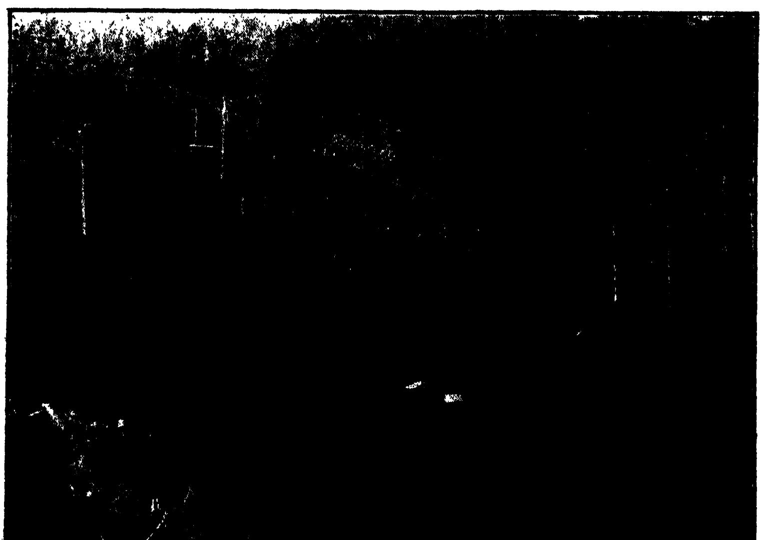
HEAVY plantings of bananas during the past season increased the acreage in this State to 21,663 acres—which is only 626 acres less than the record year, 1934. Plantings were comparatively heavy and destructions light in all districts. New areas planted totalled 4,527 acres, and 1,074 acres were destroyed, thus resulting in a net increase of 3,453 acres. There are now 3,177 commercial growers as against 2,564 last year. The accompanying table gives the figures for the respective districts in detail.

The Australian production in 1934 was 1,488,127 tropical cases from 23,923 bearing acres; in 1935 it was 1,873,914 cases from 27,556 acres; and in 1936 it was 2,003,267 cases from 31,577 acres.

There are now about 27,000 bearing acres in New South Wales and Queensland, and an increase in production to nearly 2 million cases can be expected next year, with probably a further increase in 1948. Whether this production can be marketed at satisfactory prices to growers will depend on many factors, the most important being the buying capacity of the consumer.

It is not likely that the problem of over production, or under consumption, will be overcome by governmental restriction of production by the limitation of areas. Rather is the solution to be found in other avenues, principally increased consumption. To safeguard the grower, it is necessary for growers to stimulate consumption by producing quality fruit and for their organizations to improve its distribution and marketing.

Before consumption can be increased and maintained at the higher level it will first be necessary to have a continuity of supply of good quality fruit for marketing. This good quality fruit must be produced in sufficient quantities to meet the demands of



A Well-protected Banana Plantation With a North-easterly Aspect.

all markets at all times. Some of the bananas offered for sale in the past have been anything but good quality.

Influence of Plantation Methods.

Increased consumption, therefore, starts with the grower, who should establish his plantation in suitable soils, in well sheltered positions above the frost line, on the correct slopes and in favourable climatic regions.

All seasonal plantation operations such as cultivation, desuckering, and fertilizing should be carried out conscientiously in a competent and skilful manner at the proper time. Plantation diseases and pests such as bunchy top, leaf spot, leaf fall, beetle borer and thrips must be kept in check by applying control measures which have proved successful in practice for years past.

The careful handling and packing of good quality fruit is essential, otherwise it will lose its attractiveness to the public. All bruises or markings, although not obviously noticeable on green bananas, show up distinctly as black blemishes on yellow ripe fruit. Grade the fruit honestly to correct sizes, discarding all undersized and damaged bananas. All poor quality fruit should be kept off the fresh fruit market. Only pack fruit of the one size tightly and neatly in each case. The cased fruit should then be dipped in a suitable mixture to prevent market diseases such as squirter, black-end and wet end which seriously affect the appearance of the fruit and considerably reduce prices.

After the grower has placed the fruit in a convenient and protected place for the carrier, it should be transported to railhead, in covered lorries which have good air circulation, to ensure maximum protection against weather conditions. Much fruit deteriorates before leaving the banana districts because packed cases are exposed to the sun and the pulp temperatures of the fruit are so high that ripening has commenced, which will continue in transit, and routine handling in the markets is upset. These practices are just as important in stimulating consumption as the subsequent marketing methods.

N.S.W. Banana-growing Statistics 1945-46—Compiled in Districts.

District.	Zone.	Acreage at 1/4/45.	Acreage Planted, 1945-46.	Acreage Destroyed 1945-46.	Increase.	Decrease.	Total Acreage, 1-4-46.	No. of Growers 1 acre and over.	No. of Growers less than 1 acre.	Approx. Total Acreage under 1 acre.
Tweed River	1	2,125¼	391½	105½	285¾	...	2,411	278	30	3
	2	1,140¾	330¼	63¾	266½	...	1,407¼	209	73	8
	3	1,675¼	457¼	74	383¼	...	2,058½	311	23	2
	4	527¼	126	41½	84½	...	611¾	101	4	1
Total	...	5,468½	1,305	284¾	1,020¼	...	6,488¾	899	130	14
Brunswick River	5	4,922¾	1,095¾	337½	758¼	...	5,681	823	90	15½
Richmond River	6	355¼	199¾	30¾	169	...	524¼	110	204	29
	7	838¾	347¼	54½	292¾	...	1,131½	208	176	24½
	8	1,409½	483¼	72	411¼	...	1,820¾	316	75	13
	8A	503¾	119½	32	87½	...	591¼	117	52	5½
	14	12½	16½	4	12½	...	25	8	16	1
Total	...	3,119¾	1,166¼	193¼	973	...	4,092¾	759	523	73
Clarence River	9	191	94½	10	84½	...	275½	53	369	40
	10	...	...	...	...	...	...	...	2	¼
	12	7½	...	7½	...	7½	...	...	2	¼
Total	...	198½	94½	17½	77	...	275½	53	373	40½
Coff's Harbour & Woolgoolga	11	2,932¾	469	157¾	311¼	...	3,244	409	187	58
Macksville and Kempsey and Port Macquarie.	13	1,306½	277¾	77	200¾	...	1,507¼	158	116	6½
	16	167½	32	6	26	...	193½	38	61	5¼
	16Y	65¾	87	...	87	...	152¾	28	4	½
	17	28	...	...	...	...	28	10	22	2¾
Total	...	1,567¾	396¾	83	313¾	...	1,881½	234	203	15
TOTAL FOR ZONES 1-17	...	18,210	4,527¼	1,073¾	3,453½	...	21,663¼	3,177	1,506	215¾

Need for Modern Ripening Rooms.

Accelerated railway transport services would reduce the time required to transport the fruit to market and pre-cooled and air-

conditioned trucks would provide means for carrying the fruit at correct temperatures.

The most important single factor that will increase consumption is to ripen the fruit in modern ripening rooms where temperatures and humidity can be controlled. Fruit so treated is a better colour, more inviting and will keep for a longer period before spoiling—which suits both the retailer and housewife. Modern ripening rooms must be controlled by expert ripeners to obtain good results—and a full knowledge of

Williams' Hybrid Bananas.

methods of ripening is only acquired after years of experience. There is an urgent need to have all bananas marketed in Sydney, Newcastle, Melbourne and Adelaide ripened by scientific methods and the installation of modern rooms for this purpose is necessary. About four-fifths of the fruit marketed in Sydney passes through modern ripening rooms and it is desirable that the balance should be similarly treated. More up-to-date ripening rooms are also required in the Newcastle and Adelaide markets.

The greatest need for improvement in scientific ripening is in the Melbourne markets, where little has been achieved in installing modern rooms, notwithstanding that this city receives about one-third of the bananas produced in the Commonwealth. Growers, through their organizations, should endeavour to rectify this unsatisfactory position.

During periods of heavy supply, such as was experienced last February and March in all markets, ripening and holding space was inadequate to handle properly all the bananas, with the result that some of the fruit was put on the market in an unsatisfactory condition. This retards the sale of ripe fruit at the very time when heavy clearances are essential.

Distribution to Country Towns.

There is a sectional opinion in the banana industry that if modern ripening rooms were erected in country towns, the problem of distribution would be solved. If such rooms existed they would certainly help distribution. They would serve thickly populated country districts and cool stores or holding rooms in other towns in the region. Direct distribution to the country ripening rooms, according to their capacity, would result. It would be necessary for growers to support any development along these lines to ensure that the country centres functioned successfully and capital was not wasted in establishing them.

The opening of wholesale markets in selected suburbs of the capital cities is worthy of investigation. This should simplify the handling and distribution of fruit in the metropolitan areas.

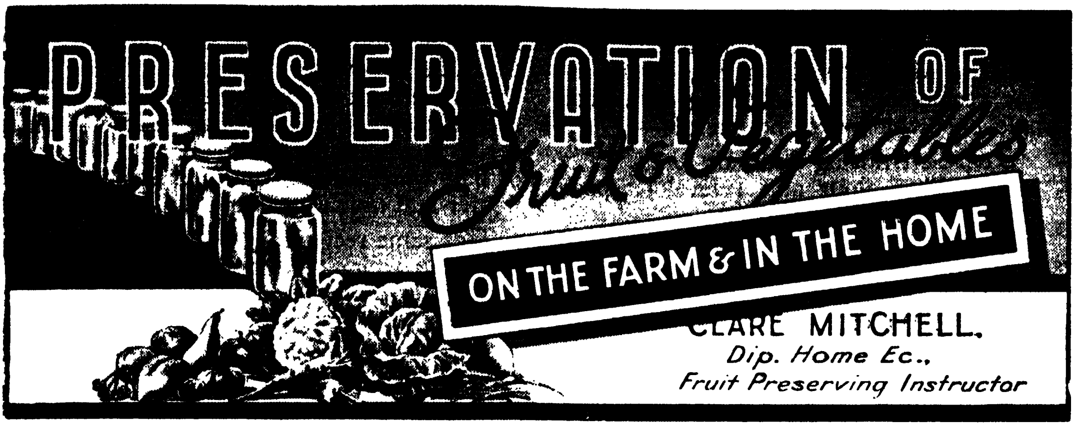
Better Publicity Needed.

A well organised and properly controlled publicity campaign, using all avenues available for this purpose, would improve the consumption of this fruit. Any such campaign should be entrusted to persons who understand the banana. Emphasis should be placed on the immense value to be obtained from bananas as a food, and not as a fruit. Other countries throughout the world refuse to accept the banana as a fruit, as we do in this country, but rather as an important adjunct to the food supply. A suitable slogan should be selected. England has chosen "The All-Food Fruit" and America "A Meal In a Minute." Surely we can "coin" as good a slogan.

Use of Lady's Finger Varieties.

Nearly all of the bananas cultivated in Australia are of the Cavendish type. Such

(Continued on page 372.)



COOKING FRUIT WITH MEAT AND VEGETABLES.

THE uses of fruit are many and varied. We are apt at times to slip into the habit of only using fruit raw or stewed or baked as a dessert, whereas it has many interesting possibilities if used in combination with meats or with vegetables.

In May issue we discussed fried pineapple and its uses, especially as an accompaniment to fried meats. Now, it is as well to consider some of the other fruits.

Some of the ways described below of using fruit with meat and vegetables may seem strange, but if tried will prove popular with most people. After all, apple sauce is the traditional accompaniment for pork, orange for duck, and red current jelly for mutton. With this in mind, grilled bananas are not such a drastic change as it would appear.

Grilled Bananas.

Grilled cutlets, chops or steak are much nicer if served with banana rolls. The rolls are easily made by peeling bananas, and cutting each one into four. Each piece is then rolled in a quarter of a rasher of bacon and secured with a toothpick. It is then grilled for about three minutes and served hot. It looks most attractive, too.

Prunes as an Addition to Steak Stuffing.

Prunes are gradually appearing on the market now and they make a delightful addition to the stuffing for baked or braised stuffed steak. The stuffing is made as follows:—

- 2 cups Breadcrumbs.
- 1 dessertspoonful Chopped parsley.
- Salt and pepper.
- ½ cup Chopped cooked prunes.
- 1 tablespoon Dripping.
- 1 tablespoon Milk.
- 1 stick Celery, finely chopped (if available).

Mix breadcrumbs and seasoning together and rub fat in. Mix prunes through thoroughly. Add chopped celery and enough milk to moisten. Fill the pocket in the steak with this seasoning and bake or braise it until tender.

Apples and Oranges.

Apples are useful, too, for many dishes when making Shepherd's Pie with left-over cold meat. A grated apple mixed in improves the flavour and adds to the quantity.

Fried apple rings go well with meat fritters or with rissoles or croquettes. The apples are merely peeled and cored, then cut into thick rings and fried for a minute or so on each side until golden brown.

Orange slices and celery make cold lamb or mutton into an interesting meal, particularly if green vegetables are added.

Fruit Fritters.

Fruit fritters make a nice breakfast if served with bacon, as well as being a delightful sweet when served with lemon and sugar. Sliced oranges, pineapples, apples, pears or bananas added to a batter and fried are always popular.

The same batter is used whether the fritters are for a savoury breakfast or a dessert. Many people have a favourite batter recipe, but the following is a good simple one which may be useful:—

4 oz. Self-raising flour, or
Plain flour and 1 level teaspoon baking powder
Pinch salt.
1 Egg.
½ pint Milk.
½ pint Water.

Sift the flour, rising and salt into a basin. Break the egg into a well in the centre of the flour and stir it in with a wooden spoon. Add the water gradually, beating well. By the time the water is added all the flour should be mixed. Beat well; gradually add the milk and then allow the batter to stand for a few minutes before using. The use of half water and half milk makes the batter lighter and much more crisp.

This same recipe may be altered by separating the white from the yolk of egg and adding the stiffly beaten white at the last minute. This gives a rather fluffy batter.

This batter is suitable for use with all fruits or with meat or fish.

Banana Industry Problems—*continued from page 370.*

varieties are Mons Marie, Williams Hybrid and Viemama, although different in plant appearance to the Cavendish, are "sports" of this dwarf variety and produce similar fruit.

The Cavendish banana is well suited for commercial production and the fruit is of excellent flavour, but it does not handle and carry well and has only a short life after ripening. Consequently heavy losses of fruit are sometimes experienced, more particularly in the summer months.

Encouragement should be given to growing other varieties of the Lady's Finger type as they carry better than Cavendish, ripen a bright, canary colour and keep longer before spoiling. A few days' extended life in the eating stage tremendously assist the retailing of bananas, and this also is in the interests of the consumer.

Preparations for Shearing.

MANY breakdowns in machinery and delays from other causes can be avoided by proper preliminary organisation of shearing operations. Many losses from such infections as tetanus can also be avoided by seeing that the shed and yards are in as clean a condition as possible before operations are commenced. Following are some jobs which should be attended to without delay:—

1. Remove any sheep skins, grain or other material that has been stored in the shed, and give the whole shed a thorough cleaning. See first that the roof lights are cleaned, so that the maximum amount of light is ensured to the expert, shearers and others handling the wool. A surprising amount of dust collects, too, on the rafters and under the roof, and could, with advantage, be removed. Pay particular attention to the shearing board and sheep pens. The shearing board should be given a thorough scrubbing with hot water containing a carbolic disinfectant in the proportion of 1 to 100. The counting-out pens and the branding race should also be thoroughly cleansed, and their spraying with disinfectant is a wise precaution.

2. Attend to any necessary repairs in the shed and in the yard. Fill up the depressions about yard gateways, thus preventing the collection of water at these points and the wetting of sheep by splashing. If lambs are to be shorn it will be necessary that the fences dividing the counting-out pens be wire-netted or in some other way made lamb-proof.

3. Give the machinery a careful look-over. Pay special attention to the driving gut core, which is liable to perish if neglected. If the owner is not an expert it is a very good plan to forward the hand-pieces to the agent for complete overhaul every other year. Make sure that combs, cutters and emery paper are on hand. If the machinery is driven by a steam plant, make sure also that there is sufficient fuel to last through the shearing.

4. See that all other equipment necessary is in readiness. Such equipment includes wool packs, branding material, stencils, bale fasteners, disinfectant for the shearing board, a cloth to cover the wool table while shearing lambs, and a set of boards for picking up lambs' wool.—SHEEP AND WOOL BRANCH.

PLANT DISEASES

Notes contributed by the Biological Branch

DISEASES OF ROSES.

IN coastal and tableland districts, Black Spot and Powdery Mildew are the most important of the diseases affecting roses, and in humid weather may cause considerable defoliation and weakening of the plants.

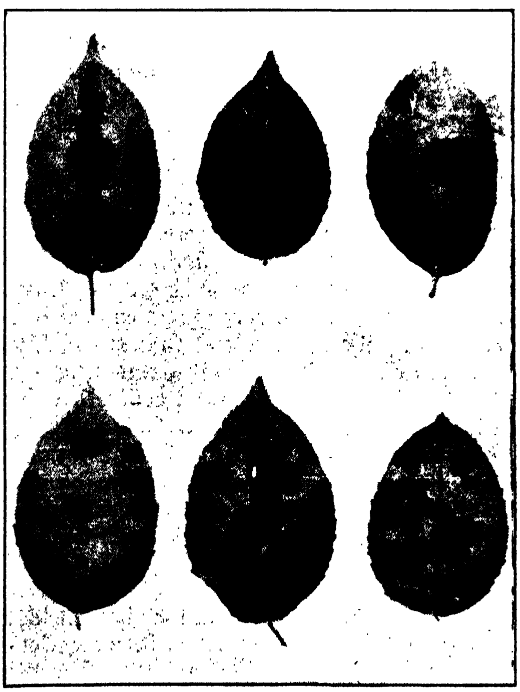
Black Spot.

This disease is caused by a parasitic fungus, *Diplocarpon rosae*. It develops as black, more or less circular spots with fringed or feathery margins. As a rule the spots develop only on the leaves, but in very susceptible varieties the young stems may also be attacked. If infection is heavy the leaves turn yellow and fall prematurely and when a new set of leaves is produced these may become affected also. Continual defoliation weakens the plant and the blooms are fewer and of inferior quality. All types of roses are susceptible, but some much less so than others.

The disease is favoured by humid conditions, and is, therefore, usually worse where close planting results in shading and lack of ventilation, preventing the rapid evaporation of excess moisture. Free circulation of air is essential for disease control.

Powdery Mildew.

This disease is caused by the parasitic fungus *Sphaerotheca pannosa*. It is most prevalent during warm humid weather. Some varieties, such as Cecile Brunner, are highly resistant and others, including some hybrid tea roses, climbers and ramblers, *e.g.*, Dorothy Perkins, are very susceptible. Infections developing on young leaves cause distorted, blister-like areas which later become covered with a white, powdery



Rose Leaves affected with Black Spot.

Powdery Mildew of the Rose.

growth of the fungus. Young shoots may become completely infected and are distorted and dwarfed. If the leaf is mature at the time of infection little distortion is caused. Flower buds may also be infected and the flowers completely spoiled.

Anthracnose.

This disease, although of distinctive appearance, is not well known to rose growers, probably because of confusion with Black Spot. In this State it is much less damaging than Black Spot, but in some years causes considerable disfigurement of foliage. Cool humid weather favours the development of Anthracnose. It is caused by a parasitic fungus, *Sphaceloma rosarum*. Spots are usually produced on the leaves, but stems and flower parts can also be attacked. The spots are at first small, black and circular, with a well defined margin. As they increase in size the centre becomes ashy grey, and may later fall away, the margin remaining black. The leaf tissue in the vicinity of the spots often becomes yellow or reddish, but premature defoliation is less common than with Black Spot.

Rust.

This disease is less common than Mildew, Black Spot and Anthracnose, fewer varieties being susceptible. When present, however, it can be very destructive. It is caused by a parasitic fungus, *Phragmidium* sp. It is readily recognisable because of the production of bright orange powdery spots on the under surface of the leaves. These are masses of spores. Towards the end of the season, dark-brown or black spore masses appear with the orange spots. These are specially resistant spores, capable of lasting over the winter months and producing infection in the spring. The upper surface of infected leaves becomes mottled with yellow. Such leaves fall prematurely.

Control of Leaf Diseases.

Since the fungi causing diseases of the foliage can over-winter on the fallen leaves, control measures should include strict attention to sanitation. Dead leaves should be raked up and burned in the autumn. Immediately after pruning the plants should be sprayed with Bordeaux mixture 1-1-10 plus white spraying oil at the rate of 1 fluid oz. per gallon of spray, or with lime-sulphur one part to nine parts water.

During the growing season regular applications of dusting sulphur will hold the diseases in check. The dusting should be done during the cooler part of the day to minimise possible burning of the foliage, and

Rose Anthracnose on Leaves.
[After Jenkins and Massey.

Rose Anthracnose on Stem.

[After Jenkins and Massey.

the air should be still. If the weather is wet, and therefore conducive to disease development, it may be necessary to dust at weekly intervals. Otherwise fortnightly or three-weekly intervals should be sufficient. A fine grade of dusting sulphur should be used. Flowers of sulphur do not give adequate control.

Dusts are usually used for the control of rose leaf diseases because they leave no objectionable deposit on the foliage. If a spray is preferred, Bordeaux mixture 1-1-40 plus white oil, 1 fluid oz. per gallon, or wettable sulphur 5 lb. per 100 gallons, or lime-sulphur 1 in 50 may be used. Ready-prepared "Bordeaux" mixtures, sold commercially, are not as satisfactory as the home-made spray (*see* Spray Leaflet No. 1).

The stimulation of vigorous growth by correct manurial and cultural treatment is a necessary part of any disease-control programme.

Stem Canker.

The commonest cause of Stem Canker in rose plants in this State is the parasitic fungus *Coniothyrium fuckelii.* The disease is also known as "Graft Canker" and "Common Cane Canker." Infection does not occur on leaves or blooms.

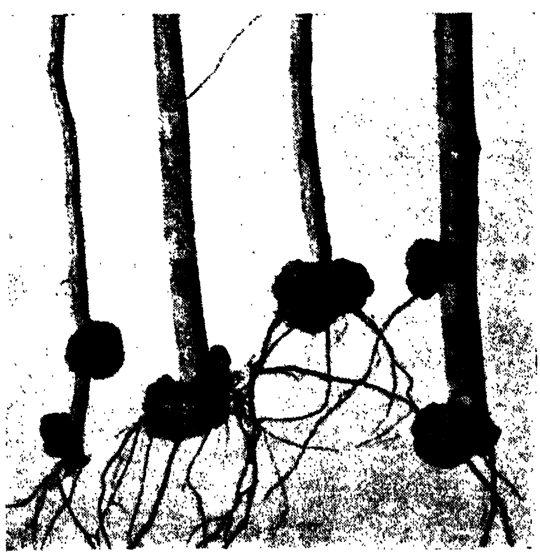
The first symptoms are small, pale yellow or reddish spots which develop on the bark. As the infected areas increase in size and age, the colour turns to brown and the bark develops cracks and becomes sunken.

The presence of the fungus may be detected by the development of numerous tiny, black, pin-point structures on the infected areas. These are the fruiting bodies of the parasite. Infection can occur through injuries such as thorn punctures, but most commonly starts at cuts made during pruning or flower gathering. In the more resistant varieties the canker development is

Stem Canker of the Rose.

checked where the branch joins the main stem, but in susceptible varieties the canker progresses down the stem to the base, killing the whole cane and eventually the plant. Losses are also sometimes experienced following budding.

Control.—Remove and burn all diseased canes, cutting well below the canker. The cut surface of the stems may be protected with a dab of Bordeaux paint. Cuts should be made obliquely and close to the stem or



Crown Gall on Young Rose Stocks.

immediately above a bud. Short stubs should never be left.

Crown Gall.

Crown Gall is a bacterial disease caused by a soil inhabiting organism, *Agrobacterium tumefaciens*. It causes gall-like outgrowths on the crowns and more rarely on the aerial parts of roses. Infected plants are dwarfed and lacking in vitality, and produce few flowers. They are best removed and burned. Nursery stocks found to be affected should be burned. Growers should examine plants very carefully for the presence of Crown Gall, and should not plant out affected specimens.

Lectures Given on Buffalo Fly Control.

ADDRESSES on methods of controlling the buffalo fly were given during the month of June throughout the far north coast district by Dr. H. G. Belschner, Deputy Chief, Division of Animal Industry. This was arranged in collaboration with the Primary Producers Union by the Minister for Agriculture (Hon. E. H. Graham, M.L.A.) as a means of giving as wide publicity as possible to buffalo fly control measures in this area where the fly was most likely to make its first appearance.

The Minister has already had demonstration traps erected at Grafton and Wollongbar Experiment Farms and also on the property of Mr. H. C. Pratt, of Murwillumbah. He is now making arrangements for a new type of trap to be erected at Murwillumbah in order that farmers may have an opportunity of observing these traps in operation.

Close watch is being kept on all developments in connection with the buffalo fly menace so that the latest information on control measures may be made available to stock owners without delay.

Official Recordings of the Departments Herds

273 Days Recording completed during April, 1946.

Name of Cow.	Name of Sire.	Name of Owner	Age at Beginning of Test.		Milk.	Av. Test.	Butter-fat.
			Yrs.	mths.	lb.	%	lb.
		Australian Illawarra Shorthorn.					
Mature Cows—							
Fairholm Molly 4th ...	Raleigh Sunray ...	Grafton Experiment Farm	7	9	11,278½	3·8	423·1
Logie Bank Rascal 3rd	Logie Bank Bonnie Boy ...	" "	10	9	9,634½	3·4	332·27
Coral Grange Queen 19th	Guardsman of Fairfield ...	" "	9	4	9,780	3·2	314·20
Senior 2 years—							
Grafton Queen Bess ...	Cowra Malcolm ...	" "	2	8	6,937½	3·9	272·48
		Guernsey.					
Mature Cows—							
Wollongbar Valencia ...	Valentine's Galore 4th of Maple Lodge (Imp.).	Wollongbar Experiment Farm.	6	8	10,406½	4·8	500·07
Wollongbar Portia 4th	Homestead Vulcan (Imp. U.S.A.).	" "	10	1	7,480½	5·3	397·47
Junior 3 years—							
Wollongbar Chrysal s 3rd	May Rose's Laddie 3rd of the Masse (Imp.).	" "	3	4	7,246½	5·0	262·04
Junior 2 years—							
Wollongbar Diana May 2nd ...	Wollongbar Peacemaker ...	" "	2	4	5,706	5·8	331·04
		Jersey.					
Mature Cows—							
Richmond Warbler 2nd	Richmond Standard ...	Hawkesbury Agricultural College.	7	3	11,998½	5·3	634·31
Richmond Norah 3rd	Richmond Nemesis ...	" "	9	7	8,505	5·0	421·01
New England Collecho 3rd	Dreaming Peter (Imp.) ...	New England Experiment Farm.	5	0	6,606	4·9	326·92
New England Dessima	New England Dreaming Prince 2nd.	Hawkesbury Agricultural College.	5	3	6,642	4·5	297·83
Junior 4 years—							
Wagga Rosalind 2nd ...	Richmond Standard ...	"	4	5	7,680	5·0	387·78
Senior 3 years—							
Wagga Lustre ...	New England Peter Boy ...	"	3	11	6,871½	5·6	387·79
Richmond Lass ...	Richmond Volunteer ...	" "	3	7	7,332	4·9	357·13

Phenothiazine in the Treatment of Worm Infestation in Domestic Animals.

B. L. REID, B.V.Sc., Veterinary Research Officer.

AMONG the more spectacular drugs of the past decade is phenothiazine. Since its discovery as an anthelmintic (worm remedy) less than seven years ago, it has become the most widely used of all drugs for the removal of internal parasites from farm animals. No other known anthelmintic removes so many different kinds of parasites from the host animals (horses, cattle, sheep, goats and pigs) as does phenothiazine.

Like all drugs phenothiazine is of beneficial action when used at the specified dosages. Above these dosages it acts as a poison. Sickness and death have been reported in all classes of livestock as a result of improper medication, but experience has shown that undesirable results are rare if phenothiazine is intelligently and properly used. In general, horses and pigs are more likely to be affected by phenothiazine poisoning than sheep, goats, cattle or fowls, and very young animals seem more prone to toxic effects than mature ones, particularly pigs and calves.

The substance has been known to science since 1885, but it was not until 1938 that it was tested as a worm treatment—in the first instance, for the removal of nodule worms in pigs. Then followed a period in which the drug was tried out for parasitic infestation of all the domestic animals with such successful and promising results as to render it apparently one of the most remarkable anthelmintics yet discovered. With wider experience, however, certain limitations to its use have become apparent.

Phenothiazine is liable to change to a reddish-coloured substance when exposed to the air or after passage through the animal body. The urine and milk assume a reddish tinge and may stain the skin or fleece. This colouration does not represent injury to the animal. This wool stain is not removed in scouring the fleece.

Horses.

Phenothiazine is 100 per cent efficient in the removal of redworms (*Strongylus* spp.) found in the large bowel of the horse. These worms are probably the most widespread and serious of all the worm parasites of horses. It also possesses some efficiency in the removal of the small stomach worm (*Trichostrongylus axei*). The effect on the large roundworm (*Ascaris equorum*) and the pinworm (*Oxyuris equi*) is variable, and the drug cannot be recommended as an efficient remedy for these. Phenothiazine has no effect on bots (*Gastrophilus* sp.), tapeworms (*Anoplocephala*) or the large stomach worm (*Habronema megastoma*). Phenothiazine and carbon bisulphide have been administered together as an effective treatment for mixed infections with large roundworms, redworms and bots.

Dosage.—Particular attention should be paid to giving the correct dose rate. In the past, not a few of the ill-effects noted in horses have been traced to faulty compliance with given dose rates. The most generally recommended dosages are as follows:—

Adult heavy horses 25 to 30 grammes.
Average station hacks .. 20 grammes.
Ponies .... 10 to 15 grammes.
(30 grammes=1 ounce approximately).

The powder can be given sprinkled over the feed where the horses are fed individually; if, however, a number are fed from one trough it is recommended that they be dosed separately, or be fed individually over the period of medication. There is no need to give any special previous treatment, such as fasting, etc., or to give a purge as with some other drugs. A recent recommendation has been to divide the dose up into ¼ ounce lots and sprinkle this over the feed daily. Thus an adult heavy horse would receive ¼ ounce every day for four days.

Precautions.—

1. There should be no sign of constipation at the time of dosing—the bowels should be kept loose by feeding bran or green feed in the ration during the period of medication.
2. Animals suffering from anaemia or other debilitating disease should not be given the drug.

3. Foals are more prone to the poisonous effects of the drug than older horses.

4. Although mares in foal are no more subject to poisonous effects than ordinary horses, it would be unwise to dose within two weeks of foaling.

Symptoms of Poisoning.—Some hours after the drug is given the horse becomes uneasy, there is sweating, shivering, high temperature, loss of appetite, dullness, increased thirst, collicky pains, hard breathing, jaundice (seen best in the eye membranes) and sometimes a brownish discolouration of the urine. Death may occur within a few days.

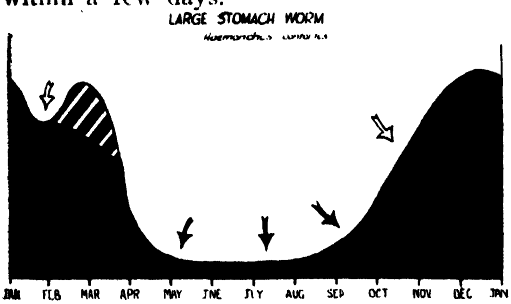


Fig. 1.—Graph of the Level of Large Stomach Worm Infestation in Sheep Throughout the Year.

A secondary rise often encountered in the late summer is shown by the stippled area.

Heavy arrows refer to stragetic drenching times; clear arrows refer to tactical drenching times.

Sheep.

Against the troublesome large stomach worm or twisted wire worm (*Haemonchus contortus*) phenothiazine is virtually 100 per cent efficient in removing both mature and immature forms. It also holds a unique position among sheep worm drenches in its highly effective action against the nodule worm (*Oesophagostomum columbianum*). The efficiency against black scour worms (*Trichostrongylus* spp.), hookworms (*Bunostomum trigonocephalum*), small brown stomach worms (*Ostertagia* sp.) and the large-mouthed bowel worm (*Chabertia ovina*) is considerable and above that of the older bluestone-nicotine drenches. It is not effective against tapeworms (*Moniezia expansa*), whipworms (*Trichuris* sp.) or liver fluke (*Fasciola hepatica*).

Disadvantages.—This method has several disadvantages when used with sheep.

1. Its cost is high—at present prices it costs about 4d. per sheep. Thus, it is about twelve times more expensive per head than older drenches like bluestone-nicotine. On this account its use may be restricted to the "tail"—the poorest tenth of the flock. These are usually the sheep which repeatedly fail to respond to the bluestone-nicotine treatment.

2. Administration is difficult. The automatic drenching gun cannot be used and drenching is done with a non-automatic drenching gun delivering a relatively bulky dose of "insoluble" powder.

3. There is the possibility of fleece staining.

Avoidance of Fleece Staining.—

When phenothiazine comes in contact with wool during drenching a reddish stain shows up a few days later, turns a brownish colour, fades and nearly disappears but shows up again as a reddish discolouration after scouring. Staining can occur from spilling the drench on the sheep in the race, also from sheep wiping their mouths on other sheep, from the soiled hands of the operator and from the urine on the breech.

During drenching, care must be taken to reduce the amount of staining as far as possible. Staining can be largely avoided if attention is paid to the following points:—

1. Rinse the nozzle in water immediately after filling the syringe with phenothiazine.

Suggested arrangements to reduce dripping where the water container is not used are:—

(*a*) Pieces of cloth tied into the corner of the container serve to drain off most of the excess suspension.

(*b*) A piece of felt supported by leather, in which several V-cuts are made, rivetted to the top edge of the container, through which the nozzle is drawn after filling.

(*c*) A piece of inner tube can be stretched tightly over the top of the container. In the centre is a small hole through which the nozzle is drawn after filling, thereby wiping off excess fluid.

2. Wipe the hands periodically on cloths etc.

3. Provide for a large yard behind the operator so that sheep can be released into it immediately after drenching. Commence drenching from the rear of the race and turn each sheep back out of the race into the yard after drenching. This prevents drenched sheep from staining the wool of

other sheep through slobbering. Sheep should not be held in the yards for more than an hour.

4. Avoid droving, holding or mustering the sheep for the following four days.

Dosage.—

FOR HAEMONCHUS and NODULE WORM the following dose rates are recommended:

Grown sheep	20 grammes.
Sheep 8-12 months	15 grammes.
Sheep 4-8 months	10 grammes.

The most popular method of administration is the drenching of fluid suspensions.

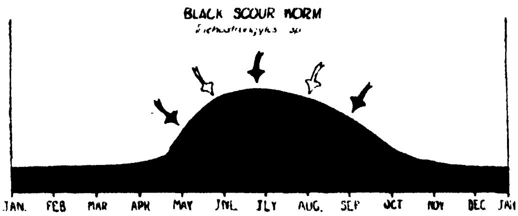


Fig. 2.—Graph showing the Cycle of Black Scour Worm Infestation in Sheep and Drenching Times.

With the brands of phenothiazine now on the market, a convenient way of measuring out the above dosages is as follows:—

Adult Sheep.

Take 1 lb. phenothiazine powder, mix to a thin paste with water, then add water to make a final volume of 25 fluid ounces (1¼ pints). This should require about 12 fluid ounces of water. A dose of 1 fluid ounce will then contain about 20 grammes of phenothiazine.

Weaners.

Take 1 lb. and add water to a final volume of 50 fluid ounces (2½ pints). One fluid ounce of this mixture will contain 10 grammes of the drug. Thus 1 lb. powder should be sufficient for twenty-five grown sheep, thirty eight- to twelve-month-old sheep or fifty weaners.

FOR BLACK SCOUR WORMS.—For full efficiency against the black scour worm doses should be increased so that 1 lb. powder does twenty grown sheep, twenty-five eight- to twelve-months-old or forty weaners. If the sheep are heavily infested 1 lb. could be used for thirty weaners.

Administration.—The most convenient method of giving phenothiazine at present is by means of a non-automatic drenching gun, fitted with a non-metal plunger. The syringe should be flushed out with water periodically, both to allow free action of the plunger and to rinse the suspension from the nozzle to prevent it dripping on to the fleece. A separate container for both water and phenothiazine is thus preferable.

Phenothiazine in Lick form.—Experiments have been carried out with regard to supplying phenothiazine with salt in a lick. Mixtures were made of one part of phenothiazine powder with nine parts of granular salt, fed in sheltered containers. The mixture is available to sheep at all times. Under Australian conditions this method has disadvantages. Firstly there is no likelihood of each sheep consuming an approximately equal amount of the lick. Secondly phenothiazine is expensive and it is more economical to drench sheep four times a year than to keep a supply of the drug in licks before them. Thirdly consumption of phenothiazine in lick form may lead to serious discolouration of the wool.

Poisoning.—Poisonous effects in sheep are very rare indeed, and given at the dose rates recommended there is little, if any, risk. Cases have been reported of 25 per cent. stillborn lambs and 1 per cent. ewe losses from this practice. It is advisable not to drench ewes less than one month before lambing is due to begin, and dangerous to drench ewes within one week of lambing.

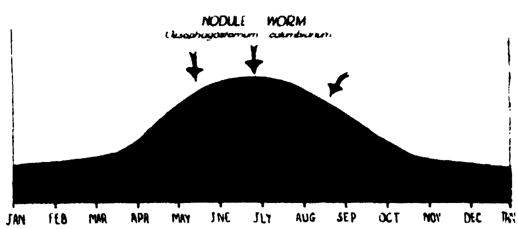


Fig. 3.—Graph showing Monthly Nodule Worm Infestation Levels in Sheep, and Drenching Times.

Goats.

Phenothiazine is equally as effective for goats as for sheep. It is used for the same types of worms, at the same dose rates and employing the same methods. Doses of up to 35 grammes (1¼ ounces) can be given to large billies with large numbers of worms. Poisonous effects are, as in sheep, rarely seen. It should be remembered that phenothiazine will turn the milk pink on exposure

to air, and therefore milch goats should be dry when treated, or else the milk discarded if for human use.

Cattle.

Results of phenothiazine for cattle are comparable with those for sheep. It acts with full (80 to 100 per cent.) efficiency against large stomach worms (*Haemonchus contortus*), stomach hair worms (*Trichostroygylus axei*), the small brown stomach

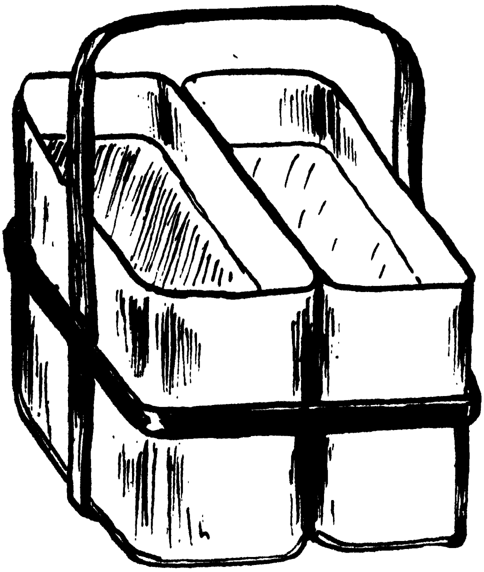


Fig. 4.—A Handy Type of Home-made Drenching Container with a Separate Container for Water.
The container on the left holds the phenothiazine suspension, that on the right contains ordinary water for rinsing the nozzle.

worm (*Ostertagia ostertagi*), and against the nodule worm (*Bosicola radiatum*). It possesses lesser and variable effects against the hookworm (*Bunostomum phlebotomum*), against small bowel worms (*Cooperia* sp.) and whipworms (*Trichuris* spp.), and is non-effective against Tapeworms or Flukes (*Fasciola hepatica*).

Dosage.—Parasitism to a serious extent is usually seen in calves and young animals. Dose rates for these animals are at the rate of 10 grammes (or about ⅓ ounce) per hundredweight body weight. For the small brown stomach worm, larger doses up to ⅔ ounce per hundredweight have been found necessary. The dose can be divided into four parts and given over a week. No definite figures can be given for mature cattle, but doses of ⅔ ounces per hundredweight liveweight have been used effectively.

Administration.—The method is as for sheep or the phenothiazine can be given in capsules. It should be remembered that the milk will be coloured and unfit for human use for about four days after treatment.

In general harmful or poisonous effects are not common in cattle and the drug can be safely used within the above dose rates. Young animals are more susceptible to injurious effects. Cases of opacity of the membrane covering the eye, with subsequent ulcer formation, have been reported in calves in New Zealand from a 1 ounce dose given in two ½ ounce lots over a week. There was an accompanying general swelling of all the tissues about the eye. Up to 75 per cent. of the treated calves became affected, but most recovered with no permanent ill effects. It is thought that the condition may represent a type of light sensitisation (similar to that seen in sheep after grazing on certain plants).

Pigs.

Phenothiazine for pigs can be recommended only for treatment of the nodule worm (*Oesophagostomum dentatum*), against which it is 90 to 100 per cent. efficient. Against the large roundworm (*Ascaris lumbricoides*), which is probably

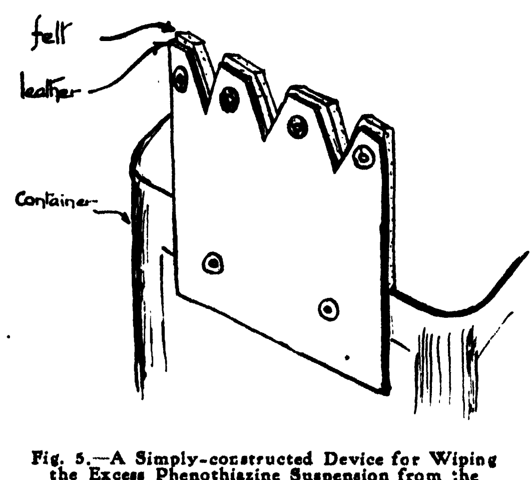


Fig. 5.—A Simply-constructed Device for Wiping the Excess Phenothiazine Suspension from the Syringe Nozzle which is Drawn Through the V-shaped Cuts in the Felt after Filling.
Some such device should be attached to the drench container when a seperate water container is not used.

the most troublesome worm of pigs in this State, phenothiazine is of varying and rather low efficiency. One recent authority states


PHENOVIS
POWDER
ICI

that it removes 70 per cent. of the worms in 30 per cent. of pigs, which seems a fair statement of efficiency for the drug. Others quote an efficiency of 50 per cent. or less. It is ineffective against the migrating intermediate stages within the young pig. Phenothiazine is ineffective for the treatment of stomach worms (*Ascarops* sp.) the thorny-headed worm (*Macracanthorhynchus hirudinaceous*) or whipworms (*Trichuris trichuria*).

Dosage.—The following dose rates are recommended:—

Weight.	Dose.
25 lb.	4 grammes.
25-50 lb.	8 grammes.
50-100 lb.	12 grammes.
100-200 lb.	20 grammes.
over 200 lb.	30 grammes.

Administration.—Phenothiazine needs no purgative after treatment and no previous treatment, although the pigs may be starved for one feed beforehand to ensure that they are sufficiently hungry to eat all the medicated food given them.

The drug is most conveniently given in the powder form in the feed, although the method has the disadvantage that one cannot be sure that each pig is receiving the correct dosage, *e.g.*, from insufficient trough space, greedy feeders, etc. Pen up the pigs in numbers that can be easily accommodated at the trough, in groups roughly equal with regard to size and weight. Mix the phenothiazine thoroughly with the amount of feed it is calculated the pigs will clean up. A half pound of powder at the above dose rates will do approximately thirty-five 30 lb. pigs; twenty-five 40 lb. pigs; or twenty 20 lb. pigs.

Poisonous symptoms have been reported and once again the young are more susceptible. Symptoms of weakness of the hind limbs, of swelling of the tissues about the eye and of opacity (clouding) of the eye membrane coming on 5 to 10 hours after treatment, should indicate that some pigs have received toxic dosages. Premature and still births, and small litter numbers have been reported from dosing pregnant sows. The percentage thus affected, however, is small, and pigs are quite suitable subjects for treatment provided due care and attention is paid to dose rates. Gross overdosing such as may result from improper mixing or one pig eating too much when group feeding is practised, may result in death.

Poultry.

Phenothiazine is highly efficient in the treatment of caecal worms (*Heterakis gallinae*), but is of poor efficiency against the roundworm (*Ascaridia galli*). It is ineffective against the other poultry worm parasites.

Dosage.—For adult birds the dose is ½ gramme, *i.e.*, about sixty birds can be treated to the ounce. For chickens the dose is $\frac{1}{20}$ to $\frac{1}{10}$ of a gramme.

Administration.—Whilst best results are obtained by individual treatment with capsules of the powder, the drug can be incorporated in a dry mash, at the rate of about 1 lb. powder to about 1,000 birds. The birds should be starved previously to ensure their cleaning up the mash within a few hours.

Birds are relatively insusceptible to injurious effects and no cases of fatalities have been reported.

Phenothiazine is of no value for the treatment of worm infestation in dogs or cats.

Inefficient Washing of Utensils—Most Common Cause of Second-grade Cream.

Of the various causes of second-grade and "border-line" cream there is none so common as the contamination resulting from inefficient washing of dairy utensils. Such contamination may result from:—

1. Failing to wash up twice daily.

2. Washing up with cold water, either once or twice per day.

3. Leaving the separator unwashed at night.

4. Failing to use washing soda to remove grease from utensils.

5. Using objectionable cloths or unclean brushes for washing.

6. Failing to scald thoroughly all utensils, brushes, etc., after washing.

7. Failing to wash and scald cans on their return from the factory.

8. Washing up utensils in polluted water—rainwater is always preferable.

D.D.T. and "666" as Larvicides.

Experiment with the Primary Sheep Blowfly.

(Lucilia cuprina)

G. J. SHANAHAN, B.Sc.Agr., Assistant Entomologist.

THE larvae of the primary sheep blowfly (Lucilia cuprina), are characteristically resistant to many standard insecticides, due to the impermeable nature of their cuticular covering. Accordingly, the development of satisfactory contact larvicides has required many years of research. Whilst it is accepted that D.D.T. is ineffective as a contact larvicide, the toxicity of the compound as a stomach poison is perhaps not generally realised. In recent experiments by the writer a heavy mortality amongst larvae has resulted when small quantities of D.D.T. have been ingested. Furthermore, the toxicity of benzene hexachloride (666) to the larvae has also been established.

The experiment was repeated twice and each treatment was replicated three times. High grade crystalline D.D.T. and 666 were used for the experiments. The D.D.T. material contained 95 per cent. para-para-isomer, whilst the benzene hexachloride had a 13 per cent. gamma isomer content.

Details of the Experiment.

The required weight of the insecticide in crystalline form at a given concentration on a weight for weight basis was thoroughly mixed with 25 gram samples of finely chopped liver. Twenty partially-fed third instar larvae were then placed into prepared cavities in the liver. Each sample was then put into a jar (capacity approximately 800 millilitres) and covered by a screw-top lid with a wire gauze centre. The jars were kept at 75 deg. Fahr. in an incubator, with high humidity, for the first 24 hours. After this period the jars were maintained at room temperature for a similar time. This plan was adopted owing to inadequate incubator space.

The liver was thoroughly searched for larvae after 48 hours. All larvae were then taken from the test jars, placed in small containers and transferred to the incubator.

The accompanying table shows the effect of D.D.T. and 666 upon *Lucilia cuprina* larvae.

Conclusions and Comments.

1.—D.D.T. at 0.5 per cent. and 0.1 per cent. concentration (W/W) is toxic to third instar larvae of *Lucilia cuprina*.

2.—666 at 0.1 per cent. concentration is also toxic to the larvae.

3.—Since D.D.T. appears to have no effect as a contact larvicide, its toxicity in these experiments may be attributed to its action as a stomach poison.

4.—Whether the 666 acted as a stomach poison is not clear, but experiments to determine its mode of action suggest that this chemical is an extremely effective contact insecticide.

TABLE of Results.

Compound and Concentration.	Percentage Larval Mortality after 48 hours.		Percentage of Larvae Failing to Complete Development.	
	Experiment I	Experiment II	Experiment I	Experiment II
D.D.T. 0·5 per cent.	86	82	92	90
D.D.T. 0·1 per cent.	66	70	90	86
666 0·1 per cent.	75	75	95	88
Control.	8	4	8	12

A statement giving further details of this work will be published later. These results are presented for the information of those interested who may be conducting investigations on similar lines.

Wintering on a Sunny Hillside.

Apiary Notes.

W. A. GOODACRE, Senior Apiary Instructor.

BEEKEEPING IN THE SIXTEENTH CENTURY.

An Interesting Book with Lessons for Apiarists To-day.

TO satisfy fully an interest in the study of apiculture, it is necessary to go further than to concentrate on the modern literature—that dealing with beekeeping since the introduction of frame hives, made available by the Rev. Dzierzon in 1848 and further improved and made workable by the Rev. L. L. Langstroth of the United States of America, the latter often known as the "Father of Modern Beekeeping." Since very ancient times man has been interested in the life history of bees and has recorded his observations.

We may, with great interest, study the valuable contribution to apiculture made by Charles Butler in the sixteenth century. It was about this time that something definite was established concerning the sex of bees and more prominence was given to the fascinating study of their natural history.

A Photographic Copy Made.

The writer is indebted to Mr. J. Stephenson of Killara, Sydney, for making available some interesting publications compiled centuries ago. Among these is Mr. Charles Butler's book, "The Femini' Monarchi' or the Histori of Bee's." Mr. Stephenson was successful, through the co-operation of a friend in Scotland, in securing a photograph of each page, and when Mr. Stephenson made full plate size enlargements from the films, this interesting and rare work was made available to me for perusal.

Scope of the Observations.

A copy of a section of the title page is given hereunder. It indicates the extent of the observations made by Mr. Butler and together with the extracts quoted later, provides an example of typical sixteenth century English. Note that in certain instances the letter "f" is used in place of a character similar to "f" used in times past instead of the letter "s", as in the words fweet (sweet) and arifing (arising), and that "d" is often used for "th," as in dem (them)—and there are other variations which are, however, easily followed.

THE
FEMINI' MONARCHI'
OR
THE HISTORY
OF BEE'S.
Shewing
Their admirable Natur', and Propertis';
Their Generation and Colonis;
Their Government, loyalti, art, induftrr,
Enimi's, VVars, Magnanimiti,
together
With the right Ordering of dem from tim' to tim' and the fweet' Profit arifing ther'of.
Written out of Experienc' by
CHARLES BUTLER, Magd.
OXFORD
Printed by William Turner, for de Author. M.P.C. XXXIV.

In some brief comments on Mr. Butler's work it is interesting to show that, although he operated the old skep hive of the time—in which any observation must have proved extremely difficult—he made very valuable additions to the science of bee culture and stimulated interest in the subject.

A Primitive Apiary in Cyprus.

Some of the Observations Made.

In writing about the presence of more than one queen in a hive, whether "Princes" as referring to virgins having issued with a swarm, or when two swarms are hived together, Mr. Butler gives the following information:—

"But if dey hav' many Princes, (as wen two fly' away wit on' fwarm, or wen two fwarms ar hived togeder) dey will not be qiet til on' of dem be cafsiered: wie fom tim' dey bring doun dat eevning to de mantle, V. wer' you may find' her covered wit a little heap of Bee's oder wif' de next day dey carri her foort' eider ded or dedly wounded."

Continuing he makes reference to having returned a condemned queen to the hive, but she was later brought forth slain, and laid before the hive door.

Mr. Butler also gives some interesting information concerning the rights of ownership of a swarm of bees. He writes—"The ancienc' Law of Criftendom permittet you to purfu' dem wedesfoever, for de recoveri of your own, But foomtim' dey fli' to faft, and fo far; you muft bee content to leav dem, haply to de happy finder. For wen you hav' loft de figt and hearing of dem, you hav' loft all rigt and properti in dem."

Many extracts of a similar nature to the above could be made from this book in relation to subjects of particular interest at the present time. The author refers to the particular care necessary in the preparation of hive material and the need to complete this work during the winter-time. The same applies to present day bee-farmers as it did with the old times in preparing skep hives.

In feeding bees, reference is made to pouring thinned-down honey into a piece of comb to act as a feeder. This is quite a common practice to-day when feeding sugar syrup in small apiaries, but is much simplified, of course, as combs are built in frames convenient for handling and replacing in hives.

There was little migratory bee-farming in those days, but on occasions it was necessary to move bees. Mr. Butler refers to the placing of a mantle over the hive and tying it securely with string. Possibly the "mantle" referred to was somewhat similar to a sheet of hessian which would be porous enough to provide ventilation. Robbing raids by bees on weak colonies caused some trouble in Mr. Butler's day, and he recommended that the entrance to weak stocks be reduced in size to give them a better chance of defending their stores.

Beekeeping is an Ancient Industry.

The life history of the bee was of course, the subject of writings long before the sixteenth century. Virgil and other great writers in their day made valuable contributions to the literature on apiculture. However, some of these great writers of ancient times were led astray by accepting the views of old beekeepers of the time—and some of the views accepted, as in Virgil's case, were rather fantastic. Nevertheless, a great deal of enjoyment can be gained and something can be learned often enough from their works. The importance of beekeeping in the national economy—the value of honey as a food for its medicinal properties, and for the making of beverages, etc.—in ancient times, makes particularly interesting reading. Old Egyptian history makes reference to bees being moved along the Nile River by boat, and in places in that country and in Cyprus, beekeepers may be found at the present time using the same old barrel-type hives as employed by the ancients, probably before the pyramids were built.

Assistance to Queen Bee following Mating.

AN observation of considerable interest to beekeepers was recently made by Mr. E. W. Robertson of Chatswood, near Sydney. It is the first record, in the writer's experience in which it has been observed that a queen bee was affected by obstruction following mating, and was assisted out of her difficulty.

Mr. Robertson reports having noticed a queen bee return to one of his hives showing evidence that she had been successful in mating with a drone on her wedding flight. It is usual for the evidence of successful mating—the organ of the drone—to be removed from the queen's body within 10 to 15 minutes; this has been observed on previous occasions by Mr. Robertson. However, in this particular instance the queen failed to dislodge the remnants of the organ, and it was still in her body after three days.

Mr. Robertson then decided to assist the queen by withdrawing the obstruction, which after a pull on the protruding thread-like section came away with a definite snap. Such a firm pull was necessary that the abdomen of the queen was greatly extended, and Mr. Robertson thought that she would be permanently injured. However, the queen commenced laying in three days' time. An inspection of the hive after three weeks revealed that the colony desired to supersede

Mr. E. W. Robertson at Work in His Apiary.

the queen, two supersedure queen cells being discovered on the brood. Following removal of these cells, two further attempts were made to supersede the queen, and then the colony settled down. The queen has been laying well and has built up the colony in strength.

Farm Improvement by Tree Planting.

THAT the axe has been far too indiscriminately used in the process of Australian land settlement is gradually being recognised, and an increasing number of inquiries are being received concerning the improvement of farm properties by tree planting.

Farmers and pastoralists are urged to take full advantage of the now approaching planting season. In proportion to the time, money and labour expended, there is no investment more profitable than the planting of a tree, and a few well placed plantings, this winter for shade, shelter, ornament or other purpose will be recognised as having been well worth while in time to come.

The best months for tree planting are from May to August. Full directions for this operation are given in "Trees on the Farm" (Farmers' Bulletin No. 167), which contains also a quantity of useful information on the subject of trees generally. It is obtainable from the Department of Agriculture, Box 36A, G.P.O., Sydney, price 1s. 2d. (postage included).

Investigation into Veterinary Research Methods.

Departmental Officer Proceeding Overseas.

MR. G. Edgar, Veterinary Research Officer at Glenfield Research Station, will leave shortly for South Africa, Great Britain, and possibly Russia, Canada, U.S.A. and New Zealand to investigate overseas methods of veterinary research and disease control.

This was announced by the Minister for Agriculture (Hon. E. H. Graham, M.L.A.), who said that Mr. Edgar would be away about six months. Arrangements had been made for him to travel by air to South Africa and Great Britain in order to allow the maximum time for investigation in those countries.

Onderstepoort, famous research station of the South African Veterinary Services, would be visited. Mr. Edgar would then proceed to Great Britain to attend conferences of the Imperial Bureau on matters dealing with animal health, and return to Australia via America and New Zealand. During these visits, Mr. Edgar would discuss with the veterinary authorities in the various countries the latest methods of research into animal diseases, and would also secure information on the control of those diseases. Particular attention would, naturally, be paid to those diseases which were found in Australia and also in the countries visited.

"I am sure," added the Minister, "that visits by scientific officers of this State to other countries must be of considerable benefit to the State generally. They also provide an opportunity of informing the authorities in other countries of the work done here and, in this case, of the general situation regarding livestock and livestock diseases in Australia."

Campaign Against Pleuro-Pneumonia.

Control Over Queensland Cattle Entering N.S.W.

A REMINDER concerning the regulations relative to the control of pleuro-pneumonia and the movement of cattle is is ued by Mr. Max Henry, Chief of the Division of Animal Industry of the Department of Agriculture. Attention is directed to the fact that a pastoral company was fined £20 at Moree recently for a breach of the regulations under the Stock Diseases Act dealing with the movement of cattle across the Northern Districts Quarantine Line. This line runs along the southern boundaries of the Tenterfield, Warialda, Moree, Walgett, Brewarrina, Bourke, Wanaaring and Milparinka Pastures Protection Districts.

It is pointed out that for the movement of recently introduced Queensland cattle which have been less than three months in New South Wales north of this line into any other part of the State it is necessary to obtain a permit from the inspector of stock in the district in which the cattle are situated. This action is required as a safeguard against the spread of pleuro-pneumonia contagiosa. It is necessary to maintain supervision over these cattle because practically every outbreak of pleuro-pneumonia which occurs nowadays in New South Wales is associated with cattle from Queensland.

Stock-owners and agents who are dealing with the movement of these cattle southwards, except by train for immediate slaughter at Homebush and Newcastle abattoirs, are warned of the importance of first ensuring that the abovementioned requirements are observed.

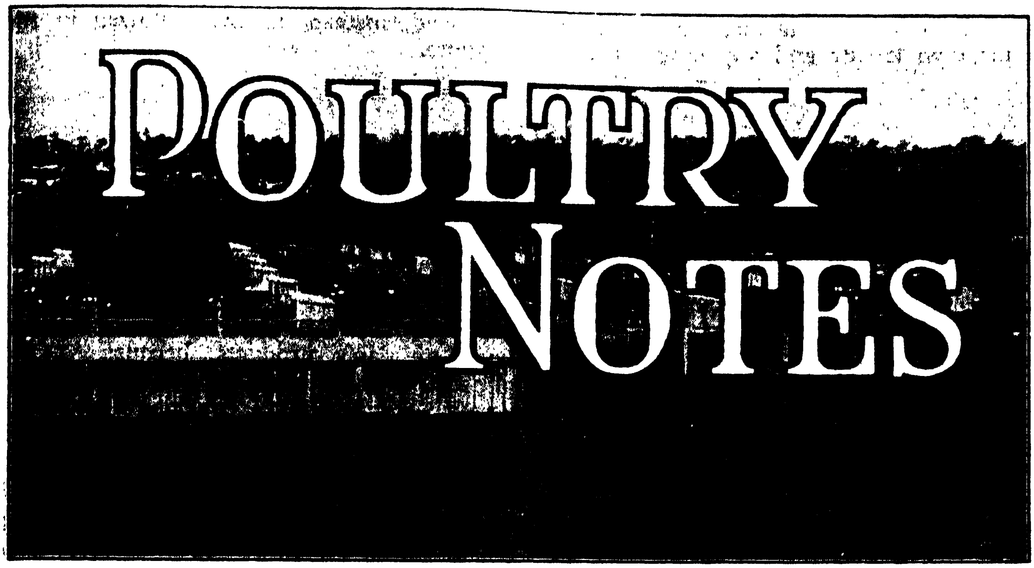
Marketing Scale-infested Citrus is an Offence.

SCALE-infested fruit is being offered for sale far too frequently in the markets and elsewhere, according to reports which have been received by the Minister for Agriculture (Hon. E. H. Graham, M.L.A.).

In drawing attention to the matter, the Minister pointed out that it was an offence under the Plant Diseases Act to consign scale-infested fruit for sale. Further, the presence of scale on fruit which was being marketed was an indication that control measures were not being carried out by some orchardists. Mr. Graham said that growers were required to eradicate scale in the orchard by fumigation or by spraying. If they were in any doubt as to the proper procedure they should get into touch with the local fruit inspector, who would be only too glad to furnish them with advice.

Mr. Graham mentioned that while the exigencies of the war period warranted some measure of toleration in regard to marketing of scale-infested fruit, due to shortage of labour and difficulty of obtaining fumigation and spraying materials, the position had now improved considerably, and, therefore, growers should be in a position to take adequate measures to control scale.

The Minister added that if scale-infested fruit was found in the markets there was no alternative but to prevent its sale until it had been fumigated at the expense of the grower, and, moreover, that would not free the grower from liability for the offence.



EGG PRODUCTION COSTS.

DURING the year just concluded there was a sharp increase in the cost of feeding poultry, due to the restricted amount of wheat available, which necessitated the use of more costly cereals as substitutes; and although mill offals were more plentiful, the supplies were not adequate and the deficiency had to be made up with wheatmeal and other meals at higher cost. Thus it is estimated that the average cost of feeding on commercial farms has risen from 8s. 6d. per bird last year to 9s. this year.

The estimated cost of producing eggs for the year ending 30th June, 1946, is shown thereunder:—

	£	s.	d.
Interest on land (5 acres at £60 per acre) at 5 per cent	15	0	0
Interest on buildings and plant (£800) at 5 per cent	40	0	0
Depreciation on buildings and plant (£800) at 3 per cent. ...	24	0	0
Maintenance costs	25	0	0
Cost of feeding 1,000 layers at 9s.	450	0	0
Purchase of 750 pullet chicks at £6/-/- per 100...	45	0	0
Municipal or Shire rates, water rates, and excess water ...	25	0	0
Incidental expenses, vaccination, etc.	15	0	0
Labour allowance	413	0	0
Marketing costs (freights or cartage, control fund deductions, handling charges)	162	10	0
Cost of producing 12,000 doz. eggs	£1,214	10	0
Cost per dozen...2s. 0·29d.			

The costs are the same as last year, except the item for feeding which shows an increase of £25.

Labour costs are based upon an amount of £6 10s. per week for the farmer, plus £75 for casual labour to cover week-end work and assistance during holidays or in the case of sickness.

It will be noted that no amount is shown for cost of rearing chickens, as it is considered that this would be adequately covered by the returns for sale of hens during the year.

The basis of production adopted is 12 dozen eggs per hen per annum, but owing to frequent changes in feeding it is doubtful if this figure has been maintained during the year, and any reduction in this respect would further affect the cost of production.

The Return to the Farmer.

An analysis of the figures shows that the cost of producing eggs for 1945-1946 works out at 2s. 0.29d. per dozen, while the average gross price paid to producers over the same period for eggs of all grades was approximately 1s. 8d. per dozen, which shows a loss of 4¼d. per dozen or £212 10s. on the year's operations. This brings

the net income to the farmer down to £200 for his own labour and any casual labour employed, instead of £413 allowed in the estimate.

Marketing Quality Eggs.

IN the March issue of these "Notes", some good advice on the handling of eggs was reprinted from the literature issued by the Poultry and Egg National Board, Chicago, U.S.A., in its campaign to increase the consumption of eggs and poultry.

Some further extracts from an article written by C. E. Rohde, formerly Extension Poultryman, University of Missouri, and distributed by Egg and Poultry National Board are given hereunder, and in view of the approaching flush season of production when every effort should be made to produce the highest quality egg for export and cold storage, poultry farmers should heed the advice given.

"The often-repeated statements, about the important and essential nutritive values of eggs may seem almost trite to poultry producers, but the poultry industry must continually strive to increase the consumer's appreciation of these important facts. This is necessary in order to develop additional demand, based on the significant and almost indispensable place of eggs in the diet.

"To do otherwise will only result in a rather poor gamble concerning the possibility of maintaining egg consumption at the high level attained during recent years. A consumer educational and sales promotion programme is indispensable, but it must be supported by a quality product that actually results in consumer satisfaction. It is simply another example of the time-worn statement —'It pays to advertise—if you can deliver the goods.'

"Consumers think and react in terms of the eggs they are eating at the moment. No amount of honest praise for eggs as an important healthful food can offset the immediate and far-too-lasting reaction to a poor quality, off-flavoured egg which is the consumer's immediate concern.

Maintain Quality to Increase Consumer Sales.

"It is sound business for the poultry industry to attempt, through advertising, to lift eggs out of the class of a price-bought staple food, because as the food value of eggs becomes more widely recognised, then larger quantities can be sold and used with a consequent improvement in the general level of national nutrition. However, in the final analysis, the American public buys a food product like eggs, fruits or certain types of dairy products, because of the pleasure derived from its use rather than because of a primary consideration of its health or nutritional value.

"War-time rationing of some food items enables poultry raisers to obtain a somewhat large percentage of the consumer's food dollar. However, in far too many instances, the quality of the eggs purchased is not of a standard that aids in developing food habits that involve greater use of eggs, based purely and simply on their taste and eye appeal.

"Maintenance and possibly an increase in post-war egg consumption will be greatly influenced by the quality considerations. It is time now for producers and handlers alike to work more closely on a sound programme of producing and marketing better quality eggs . . . .

Graded Buying is an Incentive.

"Graded buying on the basis of uniform standards for individual eggs is a first requirement for quality improvement, because this step provides an immediate price incentive. Obviously, this requires the co-operative effort of both producers and buyers, and graded buying alone is not sufficient unless the purchaser has cool holding facilities available to protect the quality of the eggs he buys. In the final analysis, the consumer price determines the amount of money producers can obtain. Unnecessary deterioration in quality during the marketing process must be avoided if producer price incentive is to be maintained.

Producer Job Not Difficult.

"Temperature and time are the two most important considerations in maintaining egg quality. Practically all eggs are of excellent quality when they are produced. It is true, of course, that differences in rations will

result in the production of eggs with variation in yolk colour as between flocks and individual birds, dependent upon the amounts of green feed, yellow corn and green feed substitutes, such as alfalfa meal, available. However, assuming that the rations supplied are nutritionally adequate, the eggs produced will have firm, upstanding yolks and a reasonably high percentage of thick white, which are the quality characteristics of freshly-laid eggs that must be protected to ensure consumer satisfaction in their use.

"The single, most important factor in maintaining this quality is prompt cooling to remove body heat and to avoid exposure to high temperatures that cause a breakdown of the thick white, further thinning of the thin albumen, and a flattening of the yolk.

"Since prompt cooling is so important, it is necessary to gather eggs at least three times each day: twice during the morning, or at 10 o'clock and noon-time, and again about mid-afternoon. Eggs that are permitted to remain in the nest all day deteriorate as much in that brief period as in three or four days at ordinary room temperatures. Such eggs, when bought on a graded basis, are actually worth 3c. to 5c. less per dozen than eggs that are promptly cooled to protect their freshly laid quality.

"Less labour is required if the eggs are gathered in a wire egg basket. In any event, the eggs should be immediately placed in a cool cellar or basement, spread out in a wire bottom tray, or left in a wire basket which permits much more rapid cooling. Actual casing of the eggs, under most farm conditions, should be delayed until the following morning, to be sure they are thoroughly cooled. Eggs that are cased within a short time after they are produced are in effect sealed in insulated compartments which prevent rapid cooling and tend to defeat the purpose of frequent gathering.

Air Cell Size Indicates the Age.

"One other factor in quality maintenance that is closely related to temperature is humidity. In present egg-grading standards, quality is, in part, determined by the size of the air cell which is normally located in the large end of the egg. This air cell results from a shrinking of the shell's contents as it is cooled. In a freshly-laid egg, it is normally about the size of a dime and less than 1/8 inch in depth. Any evaporation that occurs through the shell results in enlargement of the air cell, and its size is used as an indicator of age. The moisture content of the air in the place used for cooling and holding the eggs pending sale, should, consequently, be relatively high to prevent undue air cell enlargement . . .

"Speed is the other really important consideration in marketing. It has been accurately said that 'eggs are milk'—that they should receive the same careful handling and speedy distribution to consumers that milk requires. The time element is not as short, but insofar as practicable, eggs should be marketed twice each week. Buyers who purchase on a graded basis normally have more efficient cool holding facilities.

Other Price Factors in Graded Quality.

"Present-day food merchandising requires products that are attractively packaged and possess eye appeal. Soiled or dirty eggs are definitely lacking in this essential, and market experience indicates that such eggs, despite good interior quality, sell for about 4c. or 5c. less per dozen.

"Fortunately, the frequent gathering necessary to protect interior quality aids in clean egg production, because they are removed from the nest often enough to prevent undue breakage and the hens have less opportunity to soil them. Plenty of litter on the floor, an adequate number of nests, and clean nesting material are also important. Flock confinement until noon or mid-afternoon, especially in wet weather, is also desirable, and the confinement practice, in constant use, also aids in getting higher production and more uniform interior quality, particularly with respect to yolk colour.

"Soiled eggs can be cleaned with a damp cloth containing a small quantity of any ordinary kitchen scouring powder. Use of vinegar water or similar solutions should be avoided because they impart undesirable flavour to the eggs. Any egg that is washed should be thoroughly dry before casing."

FEEDS and FEEDING NOTES.

Contributed by

The Division of Animal Industry

How Much Hay or Chaff Should Cattle Be Fed?

MOST dairymen have probably at some time, when hand feeding, asked themselves how much hay or chaff they should give their cattle. They have probably asked themselves how much hay or chaff the cattle can handle, how little they can do on, and what is the most economic method of feeding—a lot of roughage or a little roughage.

The answers to these questions are of definite practical importance when hand feeding. For example, a farmer who had recently taken over a Metropolitan dairy approached the Department and said that, while his cows were producing well and he thought he was feeding well, his feed bills took most of his milk cheques. What was wrong?

Consideration of the ration being fed quickly showed the reason. The ration was approximately—

Lucerne hay	22 lb.
Concentrate	8 lb.

The cattle were averaging 3 gallons per head per day. The cost of the ration was as follows:—

	Cost of Feed per ton.	*Cost per lb.*	*Amount Fed lb.*	*Cost.*
Lucerne hay ...	£10	approx. 1d.	22	22d.
Concentrates ...	£8	approx. 1d.	8	8d.
Total ...	...	... ...	30	30d.

Approximate cost of feed per gallon—10d.

The roughage was the greater part of the weight and the greater part of the cost of the ration. Did the roughage provide a proportionate amount of the food value of the ration? In other words, was a food unit in the roughage as cheap as a food unit in the concentrate? Investigation showed that food units in the roughage were extremely expensive.

	Food Unit Value per 100 lb.	*Cost per ton.*	*Cost per Food Unit*
Lucerne hay ...	40	£10	Approx. 3d.
Concentrates...	70	£8	„ 1·4d.

That is, food units in the roughage were costing twice as much as food units in the concentrates.

The dairy farmer was advised to cut the lucerne hay down to about 10 lb. per day and increase his concentrate allowance up to about 14 lb. per day. This reduced his feeding cost to about 8d. per gallon—a 20 per cent. reduction in feeding cost.

It can be taken as a general rule that where roughage—that is, hay or chaff—is bought, it is a much dearer source of food matter than concentrates, and should only be fed in limited amounts. That is, in amounts sufficient to provide some roughage in the ration.

Where roughage is grown on the farm, the advisability of feeding large or small amounts of roughage must depend on the cost of production of the roughage, and the price or cost of production of concentrates. If lucerne hay can be produced cheaply, such as at £3 per ton, or silage produced at £1 per ton, these roughages will be cheaper sources of food matter than concentrates at usual prices, and it would pay when hand feeding to give a full feed of roughage and only limited amounts of concentrates.

To Summarise. When feeding bought hay or chaff, feed only a small amount, say 10 lb. per head, or even less.

Where roughages are home-grown and cheaply produced, most economic results will be obtained by feeding large amounts of roughage (20 lb. or more of hay or chaff, or 60 lb. of silage where no grazing is available), and feeding only limited concentrates.

Tubercle-free Herds.

THE following herds have been declared free of tuberculosis in accordance with the requirements of the scheme of certifying herds tubercle-free, and, unless otherwise declared, this certification remains in force until the date shown in respect of each herd :—

Owner and Address.	Number Tested.	Expiry Date.
Registered Stud Herds.		
Bathurst Experiment Farm (Guernseys) ...	28	12/10/46.
Berry Training Farm, Berry (A.I.S.)... ...	129	16/10/46.
H. F. Bradley, "Nardoo," Ashford Road, Inverell (Jerseys)	40	13/4/47.
L. W. Campbell, "Dunmallard," Fern Hill Road, Inverell (Jerseys)	39	21/7/47.
E. J. Cattell, "Kapunda," Rob Roy, Inverell (Jerseys)	121	30/6/47.
E. Chegwidden, "Austral Park," Berry (Jerseys)	88	14/1/47.
Christian Bros., Novitiate, Mt. St. Joseph, Minto	25	11/9/46.
B. N. Coote, Auburn Vale Road, Inverell (Jerseys)	85	23/7/47.
Cowra Experiment Farm (Ayrshires)... ...	53	9/7/46.
Department of Education, Yanco Agricultural High School (Jerseys)	64	1/3/47.
R. C. Dixon, Elwatan, Castle Hill (Jerseys)	29	5/3/47.
C. P. Fairbairn, Woomargama	173	17/3/48.
Farm Home for Boys, Mittagong (A.I.S.) ...	31	24/7/46.
Farrer Memorial Agricultural High School, Nemingah (A.I.S.)	44	28/8/47.
N. L. Forster, Abington, Armidale (Aberdeen-Angus)	167	24/5/48.
A. D. Frater, King's Plain Road, Inverell (Guernseys)	107	11/4/47.
W. G. A. & F. J. Frendenstein, "Chippendale," Grenfell Road, Young (Beef Shorthorns)...	47	15/1/47.
Grafton Experiment Farm (A.I.S. and Aberdeen-Angus)	249	30/7/46.
Hawkesbury Agricultural College, Richmond (Jerseys)	119	19/3/47.
Hurlstone Agricultural High School, Glenfield (Ayrshires)	52	21/7/46.
Kahlua Pastoral Co., "Kahlua," Coolac (Aberdeen-Angus)	257	30/11/47.
E. L. Killen, "Pine Park," Mumbil (Beef Shorthorns)	261	25/9/46.
G. Knight, Tannabah, Coonabarrabran ...	60	30/11/46.
Lidcombe State Hospital and Home (Friesian)	111	3/10/46.
Limond Bros., Morisset (Ayrshires)	64	26/4/47.
McGarvie Smith Animal Husbandry Farm, Liverpool (Jerseys)	72	22/2/47.
W. W. Martin, "Narooma," Urana Road, Wagga (Jerseys)	160	11/7/46.
Navua Stud Farm, Grose Wold, via Richmond (Jerseys)	120	8/10/47.
New England Experiment Farm, Glen Innes (Jerseys)	46	18/3/47.
G. H. Newnan, "Bunnigalore," Belanglo (Jerseys)	38	2/12/46.
Peel River Land and Mineral Co., Tamworth (Poll Shorthorns)	110	16/10/46.
W. R. Raper, Calool, Culcairn (Beef Shorthorns)...	86	12/2/47.
D. B. Reid, "Evandale," Sutton Forest (Aberdeen-Angus)	61	23/11/47.
Riverina Welfare Farm, Yanco (Jerseys) ...	130	26/6/46.
F. S. Simpson "Gunnawarra," Gulargambone (Beef Shorthorns)	167	19/11/47.
Trangie Experiment Farm, Trangie (Aberdeen-Angus)	155	11/3/47.
Wagga Experiment Farm (Jerseys)	15	1/2/47.
Wallaga Lake Aboriginal Station	19	29/4/47.
H. F. White, Bald Blair, Guyra (Aberdeen-Angus)	300	20/4/47.
Wollongbar Experiment Farm (Guernseys) ...	110	16/3/47.
A. Young, "Daylesford," Cudal (Beef Shorthorns)	23	25/2/47.

Owner and Address.	Number Tested.	Expiry Date.
Herds Other than Registered Stud Herds.		
114 A.G.H., Kenmore...	70	6/6/46.
Aboriginal Station, Brewarrina	14	20/5/46.
Aboriginal Station, Wallaga Lake	19	29/2/46.
Australian Missionary College, Cooranbong...	100	30/8/47.
Barnardo Farm School, Mowbray Park ...	45	25/5/46.
Brookfield Afforestation Camp, Mannus ...	243	3/5/46
N. Cameron, Montrose, Armidale (Late New England Girls School)	33	20/2/47.
A. N. De Fraine, Reservoir Hill, Inverell ...	21	8/6/47.
Department of Education, Gosford Farm Home	37	26/2/47.
Ebsman Bros., Inverell	31	22/8/46.
Emu Plains Prison Farm	115	29/1/47.
Fairbridge Farm School, Molong	25	15/4/46.
N. L. Forster and Sons, "Abington," Armidale	62	24/5/48.
F. J. Foy, The Valley Farm, Megalong Valley	25	18/12/47.
W. J. Frizelle, Rosenstein Dairy, Inverell ...	134	16/8/47.
Goulburn District Hospital	5	6/11/46.
W. S. Grant, "Monkittee," Braidwood ...	23	29/4/47.
A. Hannaford, Braidwood	10	1/2/47.
F. C. Harcombe, Hillcrest Farm, Warialda Road, Inverell	53	10/4/47.
F. W. Hunt, Spencers Gully...	27	16/2/47.
Koyong School, Moss Vale	2	5/3/47.
J. H. Lott, "Bellevue," Rob Roy, Inverell...	41	26/6/47.
Lunacy Department, Callan Park Mental Hospital	43	4/4/47.
Lunacy Department, Gladesville Mental Hospital	20	15/4/46.
Lunacy Department, Morisset Mental Hospital	79	8/3/47.
Lunacy Department, Parramatta Mental Hospital	62	26/7/47.
Lunacy Department, Rydalmere Mental Hospital	57	30/10/46.
J. O. McGufficke, "Lovely Bank," Rob Roy, Inverell	33	25/6/47.
R. G. P. McLane, Ibis Valley, Swanbrook	24	23/5/47.
S. W. Morris, "Dunreath," Swanbrook Rd., Inverell	51	23/5/48.
J. A. Murray, "The Willows," Keiraville...	21	8/8/46.
New England University College, Armidale...	19	1/5/47.
Orange Mental Hospital	63	19/3/47.
Parker Bros., Hampton Court Dairy, Inverell	125	25/8/47.
Peat and Milson Islands Mental Hospital ...	25	6/9/46.
G. T. Reid, "Narrengullen" Yass	167	14/7/46.
C. E. D. Richardson, Kayuga Road, Muswellbrook	101	3/7/46.
V. J. Rolfe, "Mount View," Inverell ...	18	9/2/47
St. John's College, Armidale	11	20/2/47.
St. Michael's Orphanage, Baulkham Hills ...	40	4/6/47.
St. Patrick's Orphanage, Armidale... ...	10	15/11/46.
St. Vincent's Boys' Home, Westmead ...	37	3/7/46.
State Penitentiary, Long Bay	13	30/11/47.
W. J. Stephenson. "Hill View," Fig Tree ...	53	1/2/47.
The Sydney Church of England Grammar School, Moss Vale	48	18/12/47.
J. M. Turnbull, "Pastime," Kayuga Road, Muswellbrook	85	20/3/47.
A. B. Weidman, No. 2 Dairy, Aberdeen Road, Muswellbrook	68	3/9/46.
A. B. Weidman, No. 3 Dairy, Kayuga Rd., Muswellbrook	38	6/9/46.
A. B. Weidman, No. 4 Dairy, Kayuga Rd., Muswellbrook	57	2/11/46.
T. J. Wilks, "Oaks Farm," Muswel brook ...	27	27/6/46.
William Thompson, Masonic School, Baulkham Hills	54	10/6/47.
A. G. Wilson, "Blytheswood," Exeter ...	66	23/4/47.
C. Wilton, Bligh Street, Muswellbrook ...	54	12/5/46.
Youth Welfare Association of Australia ...	142	19/3/46.

Tubercle-free Areas.

The following Areas have been declared tubercle-free and no cattle are allowed to be kept therein unless subjected to the tuberculin test and found free from tuberculosis :—

Bombala Area.
Inverell Area.
Braidwood Area
Municipality of Muswellbrook.
Municipality of Queanbeyan.

MAX HENRY, Chief of Division of Animal Industry.

Brucellosis-free Herd Scheme (Swine).

THE following is a list of the names and addresses of owners of herds which have been declared brucellosis-free in accordance with the requirements of the Brucellosis-free Herd Scheme (Swine). The work in connection with this scheme has been undertaken as part of the general campaign against this disease and should perform a valuable service to the industry generally. Owing to the limitations of staff it will not be possible for the Department to undertake the testing of herds in general for this purpose, and in future only herds belonging to Government institutions, registered stud herds, or those containing a preponderance of registered stud animals, will be accepted for inclusion in the list. A charge will be made for the work, since the inclusion of a herd in this list should be of benefit to the owner. After a herd has been accredited, two semi-annual tests will be required, and thereafter annual tests, provided that the conditions outlined in the agreement form are strictly adhered to and that negative results are obtained at each test. So far as the elimination of the disease is concerned, apart from placing the herd on the accredited list, this work will continue as at present.

Registered Stud Herds.

Bathurst Experiment Farm, Bathurst.
Boardman, C. M., "Fairmien," Camden.
Campbell, D., "Hillangrove," Wamberal, via Gosford.
Cocks, F. D., "Condalarra," Miranda.
Cowra Experiment Farm, Cowra.
Croft, F., Lugwardine, Kentucky.
Draper, R. E., "Glengar," Capertee.
Foley, J. B., Gundurimba Road., Loftville, via Lismore.
Garrison Battalion (2nd), Manly.
Gladesville Mental Hospital.
Government Agricultural Training Farm, Scheyville.
Grafton Experiment Farm, Grafton.
Harris, K. H., Pennant Stud Piggery, Purchase Road, West Pennant Hills.
Hawkesbury Agricultural College, Richmond.
Holland, A. L., Argonne, Tubbul.
Hurlstone Agricultural High School, Glenfield.
Maybin, N. C., Towac, Orange.
New England Experiment Farm, Glen Innes.
Newington State Hospital and Home, Newington.
Ricketts, C. C., "Mangus," Young.
Riverina Welfare Farm, Yanco.
Rydalmere Mental Hospital.
Shirley, G. F., "Camelot," Penrith.
Upston, H. E., Wattle Tree Road. Holgate, via Gosford.
Wagga Experimen Farm, Wagga.
Waterfall Sanatorium, Waterfall.
White, A. N Blakeney Stud, Orange.
Williams, G. R. B., "Gwandalan," Grenfell
Wollongbar Experiment Farm, Wollongbar.
Yanco Agricultural High School.

Herds Other than Registered Stud Herds.

A.G.H. (114 Australia).
Bathurst Gaol, Bathurst.
Brookfield Afforestation Camp, Mannus.
Callan Park Mental Hospital, Callan Park, Rozelle.
Emu Plains Prison Farm.
Glen Innes Prison Camp, Glen Innes.
Gosford Farm Home for Boys, Gosford.
Goulburn Reformatory, Goulburn.
Higgins, J. P., "Koranga," Camden.
Lidcombe State Hospital.
Morisset Mental Hospital, Morisset.
Orange Mental Hospital.
Parramatta Gaol, Parramatta.
Parramatta Mental Hospital.
Peat and Milson Islands Mental Hospital, Hawkesbury River.

Abortion-free Herds.

THE following herds have been declared free of contagious abortion (Bang's disease) in accordance with the requirements of the scheme of certifying herds abortion-free :—

Owner and Address.	Number in herd.
Registered Stud Herds.	
Armstrong, K. A., "Heathfield," Boorowa	23
Bathurst Experiment Farm (Guernseys)	28
Cowra Experiment Farm (Ayrshires)	55
Department of Education—Farm Home for Boys, Mittagong (A.I.S.)...	52
Dixson, R. C., "Elwatan," Castle Hill (Jerseys)... ...	29
Fairbairn & Co., C. P., Woomargama (Beef Shorthorns)	98
Farrer Memorial Agricultural High School, Nemingha (A.I.S.)	44
Forster N. L., Abington, Armidale (Aberdeen-Angus) ...	167
Hann, O., Chatsworth Road, St. Marys (Jerseys) ...	14
Hann, O., "Bomerah," Barrington (Jerseys)	42
Hawkesbury Agricultural College, Richmond (Jerseys) ...	96
Hill, E. Pritchard, Bowling Alley Pt. (Jerseys)	96
Hurlstone Agricultural High School, Glenfield (Ayrshires)	53
Killen, E. L., Pine Park, Mumbil...	141
McEachern, H., Tarcutta (Red Poll)	61
McSweeney, W. J., "The Rivers," Canowindra (Beef Shorthorns)	95
Martin Bros. "Narooma," Urana-road, Wagga (Jerseys)	160
Navua Stud Farm Grose Wold, via Richmond (Jerseys)	120
New England Experiment Farm, Glen Innes (Jerseys) ...	46
Peel River Land & Mineral Co., Tamworth (Beef Shorthorns)	100
Raper, F. S., Calool, Culcairn	80
Riverina Welfare Farm, Yanco	135
Scott, A. W., "Milong," Young (Aberdeen-Angus) ...	474
Simpson, F. S., "Gunnawarra," Gulargambone (Beef Shorthorns)	150
Training Farm, Berry	118
Trangie Experiment Farm, Trangie (Aberdeen-Angus)	155
Wagga Experiment Farm, Wagga (Jerseys)	25
Walker, Jas. R., "Strathdoon," Wolseley Park (Red Polls)	42
White, F. J., and Sons, Bald Blair, Guyra (Aberdeen-Angus)	152
Whitelaw, L. A., "Wendouree," Merriwa (Beef Shorthorns)	79
Wollongbar Experiment Farm (Guernseys)	110
Young, A., "Rocklynne," Cudal (Polled Beef Shorthorns)	27
Herds Other than Registered Stud Herds.	
A.G.H. (114th Australia)	66
Callan Park Mental Hospital	45
Department of Education—Farm Home for Boys, Gosford	37
Fairbridge Farm School, Molong	89
N. L. Forster and Sons, "Abington," Armidale ...	62
Morisset Mental Hospital	66
New England University College, Armidale	20
Orange Mental Hospital	61
Parramatta Mental Hospital	30
Peat & Milson Islands Mental Hospital	25
Royal Prince Alfred Hospital, Camperdown "Yaralla" Herd	94
Rydalmere Mental Hospital, Rydalmere	57
Salway, A. E., Cobargo	87

MAX HENRY, Chief of Division of Animal Industry.

Editorial—

Better Flocks and Herds.

Stock Delegation Mission.

EXPORT of beef, mutton, lamb, pigmeats, butter and other primary products contributes so largely to this country's wealth that it is vitally important to give the overseas customer just what he wants. In this regard quality is paramount, and there would seem to be one sure and quick way of satisfying that requirement—import breeds and types of animals most favoured by consumers in the countries to which we export. That, briefly, is the idea behind the New South Wales Government's action in sending abroad a delegation of stock breeders and expert officers.

The delegation comprises Messrs C. G. F. Grant (Herdmaster), E. A. Elliott (Sheep and Wool Expert) and G. M. D. Carse (Senior Piggery Instructor) of the Department of Agriculture; Messrs. F. A. McIntosh, "Woodside Park," Berry, and R. Watson-Hewitt, "Ellerdale" stud, Rouse, representing dairy cattle breed societies; and Messrs. T. H. Kelsall, "Broughton Brook," Wagga, and P. H. Wake, "Holmelee," Gilgandra, representing breeders of British breeds of sheep.

"This is the first time in the State's history," said the Minister for Agriculture (Hon. E. H. Graham, M.L.A.), "that any government has taken such a progressive step in the interests of stock raisers. The State Government feels that in bearing the full cost of sending a delegation overseas it is making an investment which will result materially in raising the standard of stock throughout the whole of the State."

Members of the delegation interested in the purchase of sheep and pigs will most likely leave for the United Kingdom early in September. Those travelling via U.S.A. and Canada are expected to get away about the end of August.

The Minister is anxious that prospective importers of stock should make full use of the delegates. The composition of the delegation—expert officers of the Department and breeders who have reached the top of the tree—is such as to inspire confidence in the delegation's ability to purchase wisely and well.

Although intending purchasers may make known their requirements even after the delegation has left, they are urged to lose as little time as possible in placing orders either with the Department of Agriculture or their breed societies. By agreement between the N.S.W. Government, the Commonwealth Government, and the Commonwealth Bank, transport charges on imported

stock will, after animals have arrived in this country, be subsidised to the extent of £100 per head for cattle, £50 for pigs, £40 for sheep and goats.

The Department of Agriculture is giving an impressive lead in the purchase of stock for the improvement of its studs. Two Guernsey and three Jersey bulls will be purchased either from United Kingdom or U.S.A.; an Ayrshire bull will also be obtained from United Kingdom; one Aberdeen Angus bull and four to six females will be obtained from the United Kingdom, and a similar number from U.S.A. or Canada. A Percheron stallion is also listed for purchase from Britain.

Three Dorset Horn rams and five ewes, a Ryeland ram, three Border Leicester rams, ten Tamworth pigs and seven Large Whites, and fourteen Saanen goats will also be purchased from the United Kingdom. In addition, it is hoped to secure fifteen Berkshire pigs either from United Kingdom or Canada.

Wide dispersal of the progeny of Departmental studs has, in the past, played an important part in the State's livestock industries. When this new blood is imported this source of supply of high-grade animals will be further enhanced. It only remains for private breeders to accept the opportunity presented by the overseas stock delegation for improving their studs, and our livestock industries will in a very short time find themselves in a position to compete on the world's markets with the best that can be produced in any country in the world.

Members of the Stock Delegation Proceeding Overseas, and the Minister for Agriculture.

Back Row.—Messrs G. M. D. Carse, C. G. F. Grant, E. A. Elliott and F. McIntosh.

Front Row.—Messrs. R. Watson-Hewitt, P. H. Wake, Hon. E. H. Graham, M.L.A., Minister for Agriculture, and T. H. Kelsall.

Mr. T. H. Kelsall.—One of the leading Dorset Horn' breeders in Australia. His Broughton Brook stud at Wagga is run on scientific and up-to-date lines. Has judged at sheep shows in capitals of several states and at all main country shows in N.S.W.

Mr. P. H. Wake.—In top flight of Border Leicester breeders in Australia. Has judged at sheep shows in Sydney and Melbourne and at many country shows in N.S.W. Expertness as a judge and thoroughness in breeding operations on his Holmelee stud, Gilgandra, have resulted in success over many years.

Mr. F. A. McIntosh.—Owner of Woodside Park stud, Berry, one of the leading Ayrshire studs in Australia Biggest exhibitor of Ayrshires at Sydney Royal shows. A prominent member of the Ayrshire Cattle Society, and of Berry Agricultural Society. Has judged at Royal shows in several capitals and at all important N.S.W country shows. Is a keen advocate of herd recording and of use of pure-bred sires.

Mr. R. Watson-Hewitt.—An ex-student of Hawkesbury Agricultural College and owner of Ellerdale Jersey stud, Rous. President of Jersey Cattle Association, and member of the Association's Classification Committee. Has judged at Royal shows throughout Commonwealth and country shows in this State. A keen advocate of herd recording and of benefits of exhibiting cattle at shows.

Both Messrs Watson-Hewitt and McIntosh are sound judges of breeds other than those in which they specialise. Both are held in high esteem in the commercial cattle world.

THE AGRICULTURAL BUREAU STATE CONFERENCE

Held at Hawkesbury Agricultural College.

THE outstanding features of the 23rd Annual State Conference of the Agricultural Bureau of New South Wales, held at Hawkesbury Agricultural College from 16th to 19th July, were the wide variety of rural interests included in the proceedings and the enthusiasm with which the delegates—many of them young men and young women—carried out the programme.

The theme of the Conference this year was "World Happiness Through Unit Efficiency" and it was developed by a programme of addresses, demonstrations, discussions, competitions, film screenings and play readings. Special sessions were devoted to women's interests.

The Conference was officially opened by the Hon. E. H. Graham, M.L.A. (Minister for Agriculture), and Mr. S. Parish, General President of the Bureau was in the Chair.

The Programme.

Among those to address the Conference on topics of general rural interest were:—Dr. R. J. Noble, Under Secretary and Director of the Department of Agriculture, whose subject was "Australia and the World Food and Agriculture Organisation"; Mr. F. G. Seamons, President of Australian Rostrum (The Individual in Democracy); Col. Sir Stanton Hicks, Professor of Physiology, University of Adelaide (Food Production—Everybody's Business); Mr. N. B. Rydge of Rydge's Business Journal (Agriculture and Land Settlement); Mr. L. V. Toyne, U.S.A. Agricultural Attache (Impressions of the Agricultural Bureau); Mr. C. C. Crane, Chief, Division of Information and Extension Services (Organisation for Extension Work); and Mr. C. H. Holland, Chief Extension Officer, Tasmanian Department of Agriculture (Agricultural Extension Work in Tasmania).

Others to deliver addresses included Mr. E. R. Smith, Executive Engineer, Water Conservation and Irrigation Commission (Husbanding Our Water Resources); Col. H. J. White, Guyra (Husbanding Our Soil Resources); Mr. H. J. Geddes, Sydney University Lecturer in Animal Husbandry (Animal Husbandry); Mr. S. L. Allman,

The Official Party at the Conference..

Front Row, Left to Right.—Hon. E. H. Graham, M.L.A. (Minister for Agriculture), Mrs. S. Parish, Mr. E. A. Southee (Principal, Hawkesbury Agricultural College), Mr. S. Parish (General President Agricultural Bureau), Mrs. Graham .Dr. R. J. Noble (Under Secretary for Agriculture), Mrs. Anderson, Mr. C. R. McKerihan (President, Rural Bank of N.S.W.) and Mr. H. Parry Brown (Organiser, Agricultural Bureau). [*Photo by K. D. Meeker.*

The Administrative Buildings, Hawkesbury Agricultural College.

Senior Entomologist (Grasshopper Control); and Mr. R. J. Swaby, Bacteriologist (Humus and Crumb Structure).

The Farrer Memorial Oration was given by Mr. H. Wenholz, Deputy Chief, Division of Plant Industry, at a Conference session, and an interesting panel discussion on "Wheat Varieties in Relation to Baking Tests" followed by demonstration was given by Messrs. J. R. Fisher, Cereal Chemist, L. Jones, Miller, and L. A. Judge, Master Bakers' Association.

Interspersed among the addresses were demonstrations in the College orchard, piggery, poultry section and dairy, and livestock judging competitions were arranged for the delegates.

A very attractive programme was presented at the special women's sessions. Talks were given on "Nutritional Work in the Department of Public Health" by Mrs. Venn-Brown, and on "Food, Facts and Fallacies" by Misses Stevens and Wilson. Miss L. Byrne, Senior Extension Officer, Department of Agriculture, spoke on the part of women and girls in the work of the Agricultural Bureau, and Mr. R. Edwards on the commercial value of flowers and shrubs.

Demonstrations were given by Miss Foskett, Women's Extension Officer, on the making of home-made sweets and on the fitting of ready-made clothes; by Miss C. Mitchell on "The Use of the Film Strip in Extension Work," and by Miss Beatrice Stewart on "Floral Decoration."

The Official Opening.

The official opening of the Conference was broadcast by Stations 2SM, 2GZ and 2KA.

In declaring the Conference officially open Hon. E. H. Graham, M.L.A., Minister for Agriculture, said:

"I have been impressed by the eagerness of men, women and youth delegates to attend—from every corner of the State—despite the present difficulties of transport and many personal difficulties created by seasonal conditions on so many farms.

The theme of your Conference this year is 'World Happiness Through Unit Efficiency.' The implication of that theme is that upon each unit in society (whether that unit be an individual in a group of individuals; or a group in the total of groups that add up to a nation; or a nation in international organisation) lies the real responsibility for a long and lasting state of world contentment. That responsibility can be met by efficiency—efficiency in one's chosen vocation, and efficiency in those many other directions that comprise citizenship.

"I understand that your General President, Mr. Sam Parish, will tell you some of the contributions to efficiency that the Agricultural Bureau, as a unit, has made this year. I would like to say here, once again, that I am whole-heartedly in support of the Agricultural Bureau movement as a means of assisting our rural people to achieve the best results from their labours. The Bureau is doing a fine work in this and many other

directions that make for better and happier living conditions for our primary producers.

"Permit me to mention some of the particular directions in which my Department is right now, and for the immediate future, planning and achieving efficiency.

"A greatly expanded programme of work is being put into operation at Hawkesbury Agricultural College, Glenfield Veterinary Research Station, and the experiment farms." Mr. Graham said it was realised that some enlargement and increase in accommodation was necessary at Hawkesbury Agricultural College, especially for the training of returned servicemen. The Department had plans for an extension to the value of £60,000 before the Federal Government. The Department also contemplated a new cannery to cost £28,000 where it would be possible to give complete instruction to students and farmer members of such organisations as the Agricultural Bureau. It was also proposed to increase the dairy instruction at the College and £50,000 was on the estimates for a new dairy products factory. We needed to investigate the possibilities of products such as powdered milk.

"One of the most important steps we have in mind," said Mr. Graham, "is the establishment of a Wheat Research Institute where research work will be conducted into all aspects of the wheat and allied industries to an extent never before contemplated.

"The McKell Farm Mechanisation Scheme has done a great deal in the way of educating farmers as to just what results can be obtained with the latest agricultural machinery available, and I have arranged for a section to be set up in the Department where the latest developments in agricultural machinery can be studied and advice furnished to farmers on all forms of mechanisation on their farms. There is no doubt that as soon as the world finally settles down to its post-war stability there will be very big mechanical developments, and we must be in a position to advise farmers as these occur.

"Just recently Schools of Instruction have been held during the winter vacation at Hawkesbury Agricultural College for pig-raisers and Junior Farmers. From my contacts with those attending these schools, I feel that very good results were achieved and I am anxious that as many farmers and Junior Farmers as possible should have the opportunity of attending similar schools. I am convinced that the best way to do this is to decentralise them to the various experiment farms, which are situated throughout the State, and as soon as the necessary staff arrangements can be made this action will be taken.

Delegates Assembled for an Official Photograph outside the Memorial Hall at the College.
[Photo by R. D. Meaker.

"During my recent visit to New Zealand I realised that we have very many problems in common which are being dealt with by the Departments of Agriculture in both countries, and each country has much that can be learned from the other. With this in view, I had a preliminary talk with the Prime Minister of New Zealand, who expressed himself as being in complete agreement with a proposal I made that we should exchange Departmental Officers for periods of, say, two to three months.

"I may say that I personally gained a tremendous amount of information in New Zealand that will be of benefit in this State, and this particularly applies to our country killing proposals. I was able to secure a lot of valuable information that can be put into practical effect in the works we are to construct here and in the method of handling the stock, which is a practical example of the value that must follow from an interchange of Departmental officers."

AGRICULTURAL BUREAU OFFICIALS, 1946-47.

THE following were elected to executive positions in the Agricultural Bureau of New South Wales at the State Conference:—

General President.—Mr. S. Parish.

Advisory Council.—Messrs. W. Barrett (Central Coast), M. Goldstein (Clarence), F. L. Flint (Illawarra), J. F. Hourigan (Lachlan), W. Cole (Macquarie), A. A. Cheney (Mitchell), J. Gown (Murrumbidgee), M. Heath (Namoi), W. C. Starr (New England), S. P. Andrews (Oxley), I. Robinson (Richmond-Tweed), H. Clothier (Southern Tableland), H. Flanagan (South Coast and Monaro), D. Auld (Upper Murray), L. Harnett (Upper Hunter), C. C. Moore (Wollondilli-Berrima), J. de Willon (Murrumbidgee Irrigation Area).

Women Councillors.—Mrs. Osland (Coast), Miss Hourigan (Inland).

The Annual Report.

IN his annual report to the State Conference, the General President, Mr. S. Parish, pointed out that many successful divisional conferences had been held throughout the year 1945-46. Field days had been held in numerous Bureau localities, many of them to cater specially for the rehabilitation of ex-servicemen.

Film evenings had gained in popularity and the co-operative ownership of projectors was intended when sufficient funds were available. Other educational activities had been undertaken in conjunction with the University Tutorial Board, the Australian Broadcasting Commission's Listening Group Organisation, and the Bureau Question Box, Discussion Library and Play Reading Library.

Special projects in the arrangement of lecture tours in co-operation with the Department of Agriculture had been undertaken and much greater co-operation had been achieved with other rural organisations.

The Progressive Farmer competition had been successfully carried out in co-operation with the Rural Bank, Country Broadcasting Services, the Department of Agriculture and the Royal Agricultural Society. The winner, Mr. K. Gardiner, was now in the United States of America.

New branches had been formed, particularly on the north coast, and in the year 1946-47 the Clarence Division would, for the first time, have representation on the Advisory Council.

The Advisory Council had arranged for a Youth School to be held immediately after the State Conference. It would be attended by eighty young people who would take an intensive course in chairmanship, secretaryship, discussion group methods, film projection, play production and related qualities that would help the development of community responsibility.

Australia and the Food and Agriculture Organisation.

THE purpose of his address, said Dr. R. J. Noble, Under Secretary and Director of the Department of Agriculture, who last year lead the Australian Delegation to the First F.A.O. Conference at Quebec, was to impress Bureau members with the importance of the work of F.A.O., and with the responsibilities of the signatory nations.

When the war in the Pacific came to a shattering end, said Dr. Noble, we saw what

could be done by co-operation between nations in time of war. It now remained to be seen what could be done in peace by efficiency. It was first necessary to visualise the magnitude of the task ahead of F.A.O. If this organisation failed we would lose a chance of achieving a goal for which the world had been striving for thousands of years.

The following notes are from Dr. Noble's address.

The Food and Agriculture Organisation is the first of the various United Nations Organisations to have been established. Others include the Security Council, the Economic and Social Council, the Court of International Justice and the Educational, Scientific and Cultural Organisation. They are all part of the administrative structure designed to promote international collaboration and co-operation so that the peace of the world may be ensured.

The League of Nations was designed to prevent war. It failed in its essential purpose, although it has much to its credit. The United Nations, in the name of the peoples of the United Nations, have pledged themselves to promote the peace of the world. It is a more positive approach towards the problem. Possibly because of this positive approach and because peoples generally realise the consequences of failure, we are justified in the belief that the United Nations Organisations will be successful.

The Food and Agriculture Organisation is designed to promote "freedom from want" —as expressed in the pledges of the Atlantic Charter. War breeds famine, famine breeds unrest, disorder and war. Freedom from want should remove one of the causes of war.

Briefly the functions of F.A.O. are to promote efficiency in the production, distribution and utilisation of the products of the farms, forests and fisheries of the world, to improve levels of nutrition and to improve standards of well-being of producers and consumers.

No one will question that these are very worthy motives. The only real question is whether these ideals can be translated into practical reality. A great deal, therefore, will depend on the continued sincerity of all nations. Collaboration gave us victory in war. Positive action in the form of continued effective collaboration is essential if the peace of the world is to be maintained. Inefficiencies in production and in distribution represent waste which an impoverished world can ill afford.

Most of the ills of the world are the result of poverty and of ignorance. Poverty means lack of purchasing power. Continued effective research and education will help to remove ignorance and promote efficiency. Increasing development of industrialisation and increasingly effective production of protective foodstuffs, particularly in underdeveloped countries will help to remove many of the evils associated with poverty and will help to promote purchasing power.

Marketing is regarded as the crux of the whole food and agriculture problem. The world has never yet had enough food. If nations do not drift towards self sufficiency and to isolationism, if there is "freedom from fear," most of the economic ills of the world will be overcome. Improvement in standards of living elsewhere and the consequent promotion of world trade will tend to increase demand for exportable surpluses of agricultural products of other countries.

The United Nations Food and Agriculture Organisation has been created for a high

GOOD CITIZENSHIP.

"You will be told many times during this Conference that one of the main aims of the Bureau is to encourage an understanding of good citizenship. If we are to become good citizens we need to undertake our responsibility actively and capably. We must learn to work in groups or in teams; we must try to overcome those enemies of progress—selfishness, indifference, destructive criticism and grumbling—and encourage that friend of progress—praise where praise is due.

"It is our duty, as citizens, to take an interest in the affairs of our own localities and of the world generally.

"May I suggest to you that you all go back from this Conference resolved to turn yourselves into even better citizens than you are now, and to try to lead other people towards an understanding of their responsibility as citizens too. Through the Agricultural Bureau you can do a great deal if just one or two of you will take the lead; you can meet one another, you can have social gatherings, you can discuss many household and family problems with your neighbours and you can help to overcome the loneliness which some women in the country have to face."—MRS. S. PARISH, *in her Presidential Address to the women delegates at the State Conference.*

and practical purpose—the promotion of the welfare of all peoples. Lack of understanding of the nature and value of the work which can be done by collaboration among nations, indifference on the part of peoples or of governments, failure to meet obligations which each of the nations have assumed in respect of their own peoples or to one another through F.A.O. will result in failure for F.A.O. Active acceptance of the new responsibilities however, could confer inestimable benefits upon all mankind.

Humus and Crumb Structure of the Soil.

IN his address to the delegates at the State Conference of the Agricultural Bureau, Mr. R. J. Swaby, Bacteriologist of the Department of Agriculture, said that the best physical conditions for crop plants are found where the soil is always friable, due to the presence of numerous water-stable crumbs, varying from the size of a pea to a grain of sugar. On the other hand, powdery, crusted, cloddy or puddled soils, containing few true crumbs, grow poor crops and often erode badly.

Over vast areas of New South Wales the crumb structure of the soils has deteriorated as the result of faulty agricultural practices, such as single crop farming without rotation of crops, excessive tillage, bare cultivation without vegetative cover, burning of crop residues, over-irrigation and excessive use of nitrate of soda and sulphate of ammonia.

How can this crumbly condition be restored? It is doubtful whether light soils such as sands and sandy loams contain sufficient clay to help cement the soil into crumbs. Work has shown that the crumb structure of heavier soils, such as loams, clay loams and clays can be temporarily improved by restoring organic matter.

Some organic materials restore crumbs quicker than others, *e.g.*, readily decomposable materials are better than resistant substances, because they encourage the development of more soil microbes. Certain soil bacteria produce sticky gums which glue the soil particles into tiny granules. These granules are then bound together into crumbs by mould threads. Humus, which is a microbial waste product, is also a valuable crumb cement.

What is the best method of applying organic matter? If it is strewn over the surface of the soil as a mulch it certainly protects the soil against erosion, but it is doubtful whether it encourages microbial activity or provides much soil humus unless buried by earthworms or ants. On the other hand, if the organic materials are ploughed in, then soil microbes flourish and humus is formed, but the surface of the soil remains unprotected.

Organic materials can be rated according to their efficiency in repairing worn out land thus: molasses (most efficient), plants dug in at the flowering stage, mature plants or straw, fresh manure, sawdust, rotted manure, compost and peat (least efficient).

The ideal method is to increase the organic matter in the soil and at the same time provide surface protection. In the better rainfall areas and under irrigation this can be done by green-manuring or better still by sowing the land down to pasture for several years. The growing crop reduces soil crusting after rain, and the living roots excrete microbial foodstuffs and mechanically bind the soil into crumbs. After a few years the pasture can be ploughed in to provide even more humus and the cropping programme re-continued until the crumbs break down once again, when the whole operation should be repeated.

THE Department of Agriculture was all out to give every assistance possible to individual landholders and local authorities, should a campaign against grasshoppers become necessary, said Mr. T. McCarthy, Chief Entomologist, recently. Maximum production of wheat and meat was doubly important this year, when the world food position was in such a parlous condition. Producers should keep this in mind, as upon their efforts to control the threatened grasshopper plague depended whether a large parcel of their products went to feed the world's starving millions or grasshoppers.

To prevent extensive damage was neither expensive nor difficult. Pastures Protection Boards had it within their power to organise and finance an all-out attack on the pest. Departmental field officers would assist landholders to locate egg-beds.

Cost of control would not fall heavily on individual landholders. In areas where P.P. Boards levied landholders, a man with 20,000 sheep would pay, at most, something less than £14.

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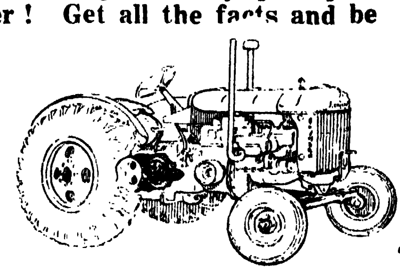

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HILLING TO CONTROL POTATO MOTH.

Good Results obtained with Disc Hiller at Guyra.

N. C. LLOYD, B.Sc.Agr., Entomologist.

HILLING soil against the plants has long been recognised as being of value in reducing loss of potatoes caused by the potato moth (*Gnorimoschema operculella*). In the past, however, hilling has, generally, not been practised with much success, and many growers, not satisfied as to its worth, do not trouble to hill at all.

In an experiment recently carried out at Guyra, hilling with discs attached to a tractor gave great promise and it is considered that this type of hilling implement approaches the ideal.

Although many growers hill, relatively few do so effectively. This results from two causes, viz.:

1.—Inefficient implements.

2.—Carrying out the operation too early in the growing period.

Present Hilling Implements Are Inefficient.

Hilling is at present carried out either with a single furrow plough, a scuffler with small hilling plates attached, or an implement with two long hilling plates attached, usually termed simply a "hiller." These implements do not perform the operation satisfactorily; they do not throw a large mound of loose soil round the bases of the plants so as to fill in cracks and protect the surface tubers—this ideal type of hill is illustrated in Figure 1—but instead they leave a hollow at the bases of the plants (see Fig. 2), so that many of the tubers are just as accessible to moths and caterpillars as if hilling had not been attempted—and the degree of control obtained is therefore disappointing.

Many Growers Hill Too Early in the Season.

The second weakness in the present methods of hilling is that many growers hill too early in the growing period of the plants. If the crop is hilled before the tuber-bearing laterals have finished forming, the tubers tend to be formed at a higher level, and therefore are, in the end, little better covered than if the plants were not hilled at all.

A more serious fault with early hilling is that it is not until comparatively late in the growing season that the tubers become liable to infestation as the result of their expansion forcing them towards the surface and the cracking of the soil as it loses moisture, and if the hill has already been formed, the value of the hilling is to a large extent nullified.

Late Hilling is Preferable.

If, however, a suitable type of hill is thrown on to the plants late in the season when the tubers are commencing to swell and the ground to crack, the tubers are protected by a loose, freshly-formed mound of soil. Possible objections to this delayed hilling are:—

1.—That yield is reduced by drying out the soil.

2.—That the plants are too large for the grower to use the implements between the rows and, therefore, much damage is done to the plants.

It is the writer's belief that these objections are not worth considering against the advantage of protecting the tubers from infestation.

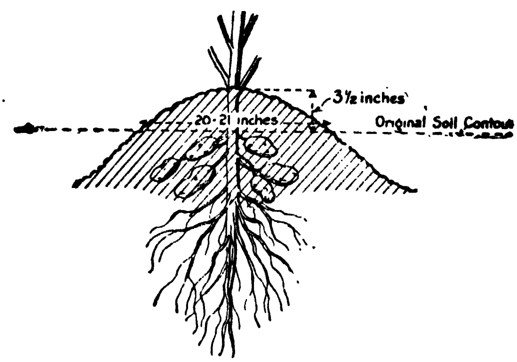


Fig 1.—Diagram showing Type of Hill to be Aimed at.

Such a hill was obtained with the disc hiller; it is broad and rounded in cross section, with the soil-drawn well round the bases of the plants so as to fill in the cracks.

In the Department's experiments, hilling has not been shown to reduce yield. In a dry season it may do so, but a slight yield reduction is preferable to a heavy loss from moth attack. By spacing the rows 3 feet apart yield is not sacrificed, and a hilling implement can be used between the rows at any time during growth. Indeed a spacing of 3 feet is essential if hilling is to be carried out properly, as sufficient soil is then available to form a large, wide hill.

The Disc-hiller.

The writer was first impressed with the possibilities of disc-hilling after observing a home-made disc-hiller at work on Mr. E. M. Hutton's property, Guyra. Inquiries showed that a Farmall "H" tractor with four discs of 12-inch diameter attached, was available at the Commonwealth Machinery Pool, Guyra, and had already been used with good results. The implement hilled two rows at once, each row being

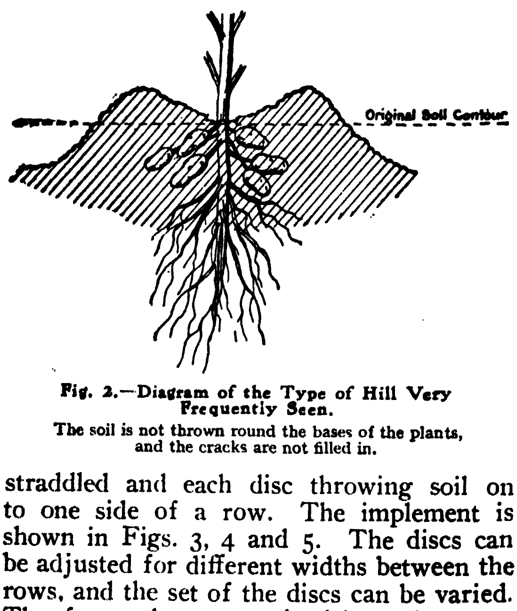


Fig. 2.—Diagram of the Type of Hill Very Frequently Seen.
The soil is not thrown round the bases of the plants, and the cracks are not filled in.

straddled and each disc throwing soil on to one side of a row. The implement is shown in Figs. 3, 4 and 5. The discs can be adjusted for different widths between the rows, and the set of the discs can be varied. The faster the tractor is driven the more soil can be thrown against the plants. The discs throw a large mound of loose soil right round the bases of the plants (as in Fig. 1), effectively filling in all cracks. An area of 20 to 25 acres per day can be hilled with the machine.

An Experiment Planned at Guyra.

An experiment was planned at Guyra this year for the purpose of obtaining information as to whether the disc-hiller was of value in reducing tuber-infestation.

The treatments used were as follow:—

A.—Disc-hiller—"intermediate" hilling.

B.—Disc-hiller—"late" hilling.

C.—Scuffler with hilling plates attached—"intermediate" hilling.

D.—Scuffler with hilling plates attached—"late" hilling.

E.—Unhilled.

The scuffler with the ordinary small hilling plates attached was included as being fairly typical of the sort of hilling usually carried out. Every effort was made to obtain as good a hill as possible with the implement.

"Intermediate" hilling was carried out when it was considered that formation of tuber-bearing laterals had been completed, but before the tubers had commenced to swell to a large size. This stage was reached by 15th February and treatments A and C were carried out on that date, which was seventy-one days from the planting date (6th December, 1945). The tubers averaged about 1 inch in diameter.

"Late" hilling was carried out when the tubers had swollen to a large size, were commencing to crack the ground and just prior to exposure to infestation. In other words, hilling was delayed for as long as it safely could be. The late hilling was carried out on 13th March, a period of ninety-seven days from the date of planting.

Design of the Experiment.—The experiment was laid out in the form of randomised blocks with four replications of each treatment. The plots consisted of four rows each 1 chain in length. The rows were spaced at intervals of 3 feet. The depth of planting was 5 inches, and the variety was Factor.

The soil was a heavy red volcanic loam typical of the commonest type of potato soil in the Guyra district. It was in good physical condition, not having been under potatoes for many years, and did not lose moisture or crack readily.

The foliage was heavily infested by larvae and a large population of adult moths was present during the course of the experiment.

Results.

The plots were harvested from 29th April to 3rd May. Results were taken from the centre two rows of each plot. The percent-

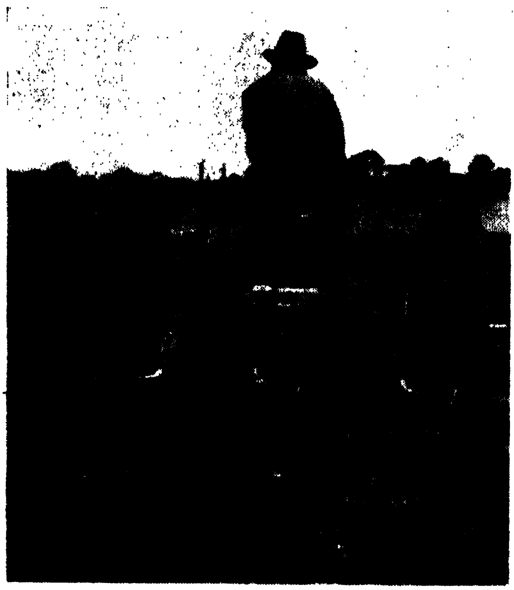


Fig. 3.—The Disc Hiller at Work, Guyra, 1946.
The fourth disc is attached in front of the rear wheels—see Fig. 5.

age tuber infestation in each plot together with the yields of clean and infested tubers was recorded.

In Table I is a summary of the results for the four replications of each treatment.

TABLE I.

Treatment.	Total Yield (per acre.)	Yield of Clean Tubers (per acre.)	Tuber infestation by weight.
	Tons.	Tons.	Per cent.
A. Disc hiller—"intermediate"	2·31	2·22	3·7
B. Disc hiller—"late"... ...	2·76	2·66	3·5
C. Scuffler—"intermediate"	2·70	2·42	10·2
D. Scuffler—"late"	2·64	2·26	13·3
E. Unhilled	2·79	2·37	15·2

Infestation in the experimental patch was fairly light, as can be seen from the figures of 15.2 per cent. for the unhilled plots. With the exception of certain dry pockets to the west of Guyra the district escaped heavy moth infestation this year.

There were three causes for the light infestation in the experimental patch, viz.—

(1) The plants were killed off prematurely by frost. This prevented the tubers from swelling to full size; thus they did not approach so closely to the surface of the ground.

(2) The rainfall was above average, and frequent showers kept the surface moist and the cracks filled in.

(3) The soil was of a friable nature.

However, it is quite obvious that the disc-hilling caused a substantial reduction in tuber-infestation, being much superior to the scuffler in this regard.

The scuffler effected only a small reduction in infestation, and it can be realised why present methods of hilling, using this implement, are of limited value in the control of moth.

There was no indication of any advantage in hilling ninety-seven days after planting as against seventy-one days after planting. It is likely, however, that in a drier season the later hilling would be superior, because a large amount of soil-cracking could take

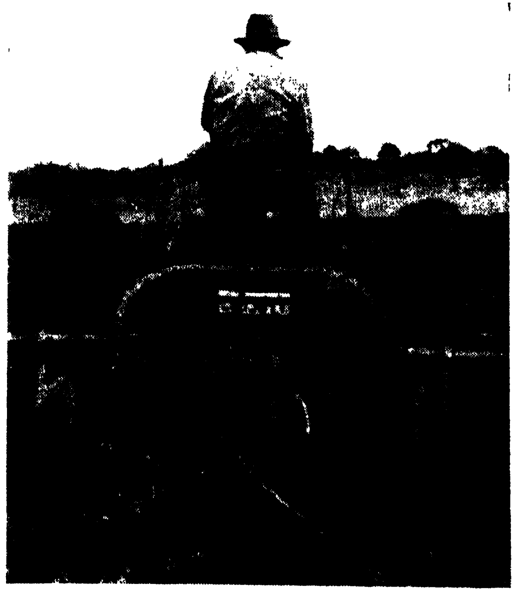


Fig. 4.—The Disc Hiller, with the Discs Out of the Ground.

place in the interval between the seventy-one-day hilling and the time that the crop is harvested.

There was an indication, in the case of treatment A, that yield was reduced. However, in two plots of the four there was no reduction in yield due to this treatment, and because of this variation, the difference in yield between treatment A and the other treatments, was found to be statistically non-significant.

Fig. 5.—Side View of Tractor, showing Attachment of Fourth Disc of Hiller.

There was no reduction of yield in the case of the other hilling treatments B, C and D.

The experiment definitely indicated the value of disc-hilling in reducing tuber infestation.

The implement will be tested further to confirm or improve upon the results already obtained, and to ascertain whether yield can be affected under dry seasonal conditions. The writer is confident that even better results are possible. In a heavier yielding crop than that in this experiment, it is reasonably certain that a substantially higher yield of clean tubers will result from the use of the disc-hiller at the correct time.

Acknowledgments.

Mr. Joe Williams, of Guyra, very kindly set aside portion of his crop for the experiment and assisted in carrying out the hillings.

Mr. R. Morgan, Manager of the Guyra Machinery Pool, made the tractor, with attachments, available for the experiment and gave much useful advice, as did Mr. J. B. Noonan, Agricultural Instructor, Glen Innes, who also assisted in carrying out the experiment.

Mr. F. McCleery, Biometrician, gave advice regarding the design of the experiment and made a statistical analysis of the results.

Agricultural Societies' Shows.

SECRETARIES are invited to forward for insertion in this list dates of their forthcoming shows; these should reach the Editor, Department of Agriculture, Box 36A G.P.O., Sydney, not later than the 15th of the month previous to issue. Alteration of dates should be notified at once.

1946.

Albury Sheep Show (A. G. Young) ... August 6, 7
Condobolin (N. J. Hanlin) ... August 6, 7
Trundle (W. A. Long) ... August 13, 14
Lake Cargelligo ... August 13, 14
Gilgandra ... August 13, 14
Peak Hill (C. McDowall) ... August 20, 21
Weethalle ... August 21
Parkes (L. S. Seaborn) ... August 26, 27, 28
Grenfell ... August 30, 31
Forbes (J. T. Woods) ... September 3, 4
Manildra (E. S. Parker) ... September 3, 4
Young (T. A. Tester) ... September 3, 4
Coolamon (R. G. Lynch) ... September 6, 7
Lockhart ... September 7
Deniliquin ... September 7
Cowra ... September 10, 11
Henty ... September 10, 11
West Wyalong ... September 10, 11
Narromine ... September 11, 12
Narrandera (T. L. Bull) ... September 13, 14
Bourke ... September 14, 15
Temora ... September 18, 19
Leeton (E. C. Tweedie) ... September 17, 18
Murrumburrah (R. J. Simpson) September 24, 25
Quandialla ... September 25
Eugowra (Miss P. Casey) ... September 25
Ariah Park (F. Meacham) ... September 25
Grafton (C. W. Creighton) September 26, 27, 28
Ardlethan (E. C. Knight) ... September 27
Finley ... September 28
Mangrove Mountain Agricultural Bureau (Mrs. Roberts) ... September 28
Griffith ... October 1, 2
Walbundrie (C. Lieschke) ... October 2
Bribbaree ... October 2
Singleton ... October 3, 4
Albury (A. G. Young) ... October 8, 9, 10
Lismore—North Coast National Exhibition (C. C. Dean) ... October 15, 16, 17
Holbrook ... October 25, 26
Murwillumbah (J. L. Banner) ... October 30, 31
Bangalow ... November 12, 13

1947.

Queanbeyan (D. Vest) ... February 21, 22

PHOSPHATE PLACEMENT IN A BROWN LATERITE SOIL.

The Influence of Basic Materials on Phosphate Uptake by Plants.

N. H. PARBERY, D.Sc.Agr., Analyst.

SOME evidence has been presented in a previous article* that the placement of phosphate at varying depths in a red laterite soil from Wollongbar Experiment Farm was without any important effect on the growth of plants under the ideal conditions of a pot experiment. The present experiment was conducted with a brown laterite† from Robertson in a pot experiment at Sydney Botanic Gardens, whilst simultaneously at Robertson field plots were accorded the same treatments.

Although growth during the early stages, when phosphate was most available, was impeded by the cold winter conditions at Robertson, evidence was secured of the important effect which an adequate base supply has on placement in a strongly acid soil under field conditions. The regulated soil water conditions of the pot experiment induced results at variance with similar treatments on the field soils which are subject, particularly at the surface, to fluctuating water conditions.

The plots at Robertson were situated on old pasture land. The soil was cultivated, and lime, dolomite or cement was added to the appropriate plots three months prior to sowing. The same materials were added to soil in certain pots a similar period before sowing. To obviate the possibility of deficiencies which might influence phosphate uptake, sulphate of ammonia at the rate of 2 cwt. per acre and mixed chloride and sulphate of potash at the rate of 3 cwt. per acre were applied to all plots and pots just prior to phosphate placement and sowing. A surface layer of soil was removed to permit the placement of phosphate evenly in a plane at the indicated depths and then replaced. Italian rye grass was used as the phosphate absorbing agent. Superphosphate of ordinary grain size and of 22 per cent. P_2O_5 quality was used.

The dolomite contained about 40 per cent. magnesium carbonate and the lime was a good grade of calcium carbonate. In one pot treatment, superphosphate at the rate of 4 cwt. per acre was applied three months prior to sowing so as to determine the availability of phosphate subjected for such a period to the process of fixation in a soil which exhibits this unavoidable feature in a high degree.

All sowings were made early in April; the pots were first harvested 70 days later when the grass was about 9 inches high on the best treatments. The Robertson plots were not harvested until the early flowering stage in mid-October, when a second cut of the grass in pots was also made.

The Pot Experiments.

Table I gives details of the pot experiment treatments, yield of grass, phosphate content and phosphate absorption in the first cut.

TABLE I.—TREATMENT AND YIELDS.
First cut—70 days after sowing.

Treatments.	Yield Dry Grass.	P_2O_5 in Grass.	P_2O_5 Absorbed.	Net P_2O_5 Absorbed.
	gm.	per cent.	mgm.	mgm.
A. 3 tons dolomite...	7·14	0·39	28·0	5·3
B. 3 tons dolomite + 4 cwt. superphosphate on surface.	27·80	0·33	92·0	69·3
C. 3 tons dolomite + 4 cwt. superphosphate at 1 inch.	34·83	0·30	104·5	81·8
D. 3 tons dolomite + 4 cwt. superphosphate at 2 inches.	31·29	0·30	93·3	70·6
E. 3 tons dolomite + 4 cwt. superphosphate at 3 inches.	34·29	0·27	91·2	68·5
F. 3 tons dolomite + 2 cwt. superphosphate at 3 inches.	26·62	0·24	65·0	42·3
G. 3 tons lime	8·78	0·38	33·3	10·6
H. 3 tons lime + 4 cwt. superphosphate on surface.	33·35	0·31	104·0	81·3
I. 3 tons lime + 4 cwt. superphosphate at 1 inch.	29·17	0·30	88·5	65·8
J. 3 tons lime + 4 cwt. superphosphate at 2 inches.	30·87	0·27	82·7	60·0
L. 3 tons lime + 4 cwt. superphosphate at 3 inches.	31·15	0·24	74·7	52·0
M. 3 tons lime + 2 cwt. superphosphate at 3 inches.	20·00	0·24	48·0	25·3
K. 2 tons cement	9·79	0·34	33·3	10·6
N. Control (NK)	6·24	0·36	22·7	...
O. 4 cwt. superphosphate on surface.	18·04	0·33	59·2	36·5
P. 4 cwt. superphosphate at 1 inch	29·89	0·26	79·0	56·3
Q. 4 cwt. superphosphate at 2 inches.	26·85	0·22	58·0	35·3
R. 4 cwt. superphosphate at 3 inches.	22·74	0·21	48·2	25·5
S. 4 cwt. superphosphate at 2 inches, pre-applied 3 months.	15·88	0·22	34·9	12·2

* June, 1946, issue, page 291.

† This soil was described in July, 1946, issue, page 343.

Unlike the results in the Wollongbar laterite in which dolomite and cement produced an effect on grass growth similar to that of phosphate additions, neither dolomite, cement, nor lime, while increasing the lime content of the soil and reducing acidity, had a stimulating effect in the brown laterite, since it is not as acutely deficient in lime as the former soil. Growth on the soils treated with these substances (T.A.G.K.) was much the same as on the control (T.N.). Where superphosphate at 4 cwt. per acre was applied at various levels in the limed or dolomited soils the yields were similar, but where 2 cwt. only were applied, the yields diminished.

The highest phosphate content was found in the cuts from the dolomite, lime and cement only treatments and the control. Where phosphate was placed at varying levels, the phosphate content of the grass diminished as placement became deeper. The effect of fixation was demonstrated in the low yield from treatments where the phosphate applied three months prior to sowing had, in the moist soil, lost much of its value.

Table II gives details of the yield, phosphate content of the grass, and of phosphate absorption by the grass at the second cut.

TABLE II.—TREATMENTS AND YIELDS.—*Second Cut—132 days after first cut.*

Treatments.	Yield Dry Grass.	P_2O_5 in Grass.	P_2O_5 Absorbed.	Net P_2O_5 Absorbed.
	gm.	per cent.	mgm.	mgm.
A. 3 tons D.	53·8	0·20	108·4	21·5
B. 3D, 4S, Sf ...	58·5	0·20	116·4	29·5
C. 3D, 4S, 1 inch ...	62·1	0·21	131·1	44·2
D. 3D, 4S, 2 inches ...	50·2	0·23	116·8	29·9
E. 3D, 4S, 3 inches ...	65·5	0·21	135·2	48·3
F. 3D, 2S, 3 inches ...	64·4	0·22	140·6	53·7
G. 3 tons L	46·0	0·21	98·2	11·3
H. 3L, 4S, Sf	62·5	0·22	138·7	51·8
I. 3L, 4S, 1 inch ...	55·2	0·22	120·6	33·7
J. 3L, 4S, 2 inches ...	56·3	0·22	122·9	36·0
L. 3L, 4S, 3 inches ...	58·2	0·21	121·5	34·6
M. 3L, 2S, 3 inches ...	58·0	0·19	112·7	25·8
K. 2 tons cement ...	51·7	0·20	101·7	14·8
N. Control (NK) ...	44·2	0·20	86·9	...
O. 4S, Sf	47·2	0·21	97·3	10·4
P. 4S, 1 inch	50·5	0·21	104·2	17·3
Q. 4S, 2 inches	54·5	0·21	113·8	26·9
R. 4S, 3 inches	53·1	0·21	109·5	22·6
S. 4S, 3 inches, pre-applied	52·5	0·20	103·3	16·4

As previously found, in second growth of grass on the Wollongbar laterite, the feature again emerged that when the easily secured phosphate of fertilisers had been absorbed in the period of growth up to the first judicious grazing stage, subsequent growth on the laterites appeared to be maintained at a minimum level of phosphate nutrition and was related not closely to the amount of phosphate applied, but rather to the adequacy with which the native phosphate of the soil could meet growth demands. Hence at the second cut, growth no longer reflected treatment and treatments receiving no phosphate, and which were primarily ineffective, promoted yields in the second growth period much akin to those from treatments which had an initially stimulating effect.

That phosphate content reached the minimum level required for growth in the second cut was confirmed in the uniformity of the phosphate content of the grass from all treatments.

Table III shows the combined cuts of both growth periods, the net phosphate absorbed, and the percentage recovery of added phosphate.

TABLE III.—COMBINED CUTS.

Treatments.	Soil Reaction at End of Experiment.	Yield Dry Grass.	P_2O_5 Added.	Net P_2O_5 Absorbed.	Percentage Recovery of Added P_2O_5.
	pH	gm.	mgm.	mgm.	
A. 3 tons D	...	60·94	0	26·8	...
B. 3D, 4S, Sf	...	86·30	662	98·8	14·9
C. 3D, 4S, 1 inch	5·6	96·93	662	126·0	19·0
D. 3D, 4S, 2 inches ...	...	81·49	662	100·5	15·2
E. 3D, 4S, 3 inches ...	...	99·79	662	116·8	17·6
F. 3D, 2S, 3 inches ...	...	91·02	331	96·0	29·0
G. 3 tons L	...	54·78	0	21·9	...
H. 3L, 4S, Sf	...	95·85	662	133·1	20·1
I. 3L, 4S, 1 inch	5·4	84·37	662	99·5	15·1
J. 3L, 4S, 2 inches ...	...	87·17	662	96·0	14·5
L. 3L, 4S, 3 inches ...	...	89·35	662	86·6	13·1
M. 3L, 2S, 3 inches ...	...	78·00	331	51·1	15·4
K. 2 tons cement	5·45	61·49	43	25·4	...
N. Control (NK)	...	50·44	0	...	...
O. 4S, Sf	...	65·24	662	46·9	7·1
P. 4S, 1 inch	5·1	80·39	662	73·6	11·1
Q. 4S, 2 inches	...	81·35	662	62·2	9·4
R. 4S, 3 inches	...	75·84	662	48·1	7·3
S. 4S, 3 inches, pre-applied	...	68·38	662	28·6	4·3

The effect of treatment was obscured in the combined cuts due to the heavy growth of tissue of low phosphate content in the second period of growth. The recovery of phosphate from the superphosphate placed at varying levels in the lime- or dolomite-treated soils showed no consistent relationship to placement, and was effective at all levels from the surface to a depth of 3

inches. In the dolomite-treated soils almost as much phosphate was recovered from an application of 2 cwt. superphosphate as from 4 cwt. superphosphate applied at the same depth.

In the soils receiving no basic materials, surface or deep placement was inferior to placement at 1 inch depth, a feature consistent with results in the field experiment, but where the disparity was much greater. The poor recovery from treatments where 4 cwt. superphosphate was applied three months prior to sowing, shows that plants, under ideal growth conditions, can extract little phosphate from superphosphate which has been subjected to fixation in this type of soil for such a period. Conditions conducive of fixation exist in practice not only where crops fail, but where autumn-seeded crops remain static over long periods of cold weather.

Field Experiment at Robertson.

Only one cut—at the early flowering stage—was made on the grass on the plots at Robertson. In Table IV details are given of the relative yields of the plots, the highest, treatment 13, representing 3 tons of dry grass per acre. In Treatment 7, finely-ground superphosphate replaced the ordinary granular form.

The control soil had received nitrogen, sulphate and potash and the result obtained on the natural soil showed that these nutrients, in the absence of phosphate, were of no advantage.

Cement or lime used alone had no effect, as in the early stages of growth in the pots, on yield. This effect persisted over the whole growth period, whereas in the pot experiment good growth was made during the second growth period. Dolomite used alone had a slight effect on growth. Superphosphate (T4) applied on the surface proved wholly ineffective whereas, similarly applied on the limed or dolomited soils, a slight increase in growth resulted.

Superphosphate, in the absence of basic materials, was most effective at a depth of 1 inch, effective in the granular or very fine condition at a depth of 2 inches, but of slight value when placed at 3 inches depth. At a depth of 1 inch, 2 cwt. application of superphosphate (T9) was more effective than 4 cwt. at 3 inches, but placed at 3 inches depth the lighter application (T10) was wholly without effect on growth and phosphate recovery was negligible.

Where lime had been applied, 4 cwt. application of superphosphate was most effective at 1 inch, but at the same rate high yields were maintained when placement was at 2 or 3 inches. At 3 inches, the lighter application of 2 cwt. superphosphate per acre was moderately effective especially in comparison with the failure of a similar application in the absence of lime.

TABLE IV. FIELD EXPERIMENT.—Effect *of Placement in Untreated, Limed and Dolomited Soil.*

Treatments.	Relative Yield.	P_2O_5 in Dry Grass.	Percentage Recovery of Added Phosphate.
		per cent.	
Untreated soil	34·1	0·20	...
1. Control (NK)	32·2	0·20	...
2. Cement 2 tons	31·9	0·21	...
3. Cement 2 tons + 4 cwt. superphosphate at 3 inches.	56·4	0·22	4·4
4. 4 cwt. superphosphate on surface.	34·6	0·23	1·2
5. 4 cwt. superphosphate at 1 inch.	88·4	0·22	9·2
6. 4 cwt. superphosphate at 2 inches.	76·5	0·24	8·5
7. 4 cwt. superphosphate, fine, at 2 inches.	72·8	0·21	6·0
8. 4 cwt. superphosphate at 3 inches.	51·7	0·23	3·9
9. 2 cwt. superphosphate at 1 inch.	57·8	0·21	8·6
10. 2 cwt. superphosphate at 3 inches.	30·6	0·22	0·6
11. Lime 3 tons	29·8	0·19	...
12. Lime 3 tons + 4 cwt. superphosphate on surface.	58·6	0·20	3·9
13. Lime 3 tons + 4 cwt. superphosphate at 1 inch.	100·0	0·20	10·1
14. Lime 3 tons + 4 cwt. superphosphate at 2 inches.	89·9	0·19	7·7
15. Lime 3 tons + 4 cwt. superphosphate at 3 inches.	89·4	0·19	7·5
16. Lime 3 tons + 2 cwt. superphosphate at 3 inches.	57·4	0·19	6·6
17. Dolomite 3 tons	45·1	0·20	...
18. Dolomite 3 tons + 4 cwt. superphosphate on surface.	48·8	0·20	2·4
19. Dolomite 3 tons + 4 cwt. superphosphate at 1 inch.	88·2	0·20	8·5
20. Dolomite 3 tons + 4 cwt. superphosphate at 2 inches.	90·0	0·20	8·3
21. Dolomite 3 tons + 4 cwt. superphosphate at 3 inches.	76·4	0·19	5·6
22. Dolomite 3 tons + 2 cwt. superphosphate at 3 inches.	59·7	0·18	7·0

On the dolomite-treated plots the surface application of phosphate was of little value (T18), but high yields were obtained from 4 cwt. superphosphate at 1 or 2 inches' depths. When placed at 3 inches depth, 2 or 4 cwt. applications of superphosphate were much superior to those applications at

similar depth in the absence of lime or dolomite.

In the presence of cement, superphosphate gave no increase in growth on the Wollongbar soil, although the cement alone promoted good yields. In the present trials, superphosphate proved of less value in Treatment 3 than when placed similarly in the limed or dolomited plots (T15, 21).

The percentage of phosphate in the grass from any of the plots was at the same minimum for growth requirements as was found in the second cut on the pots.

The poor recovery of added phosphate was due to the inability of young plants, as growth languished during cold weather, to make use of the available phosphate of superphosphate before serious loss of phosphate due to fixation has been incurred. Seeding in the Robertson district as early as soil moisture conditions permit, would enable plants to make better use of phosphate.

Liming or dolomiting soils of which the brown laterite is typical, confers a much greater freedom in the placement of phosphate in soil newly prepared for seeding. The surface application of phosphate under these conditions is wasteful and ineffective, but any form of cultivation which would place phosphate at a depth of 1 or 2 inches would greatly enhance tis effect.

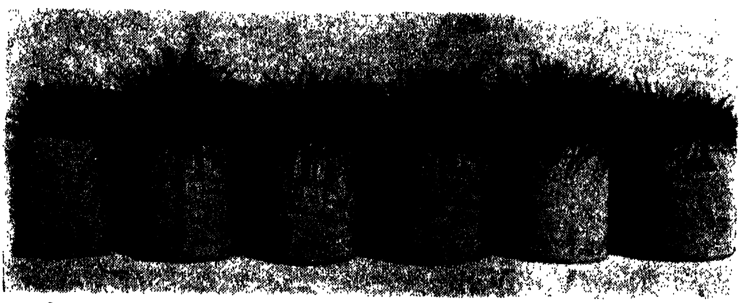
Summary.

Under the optimum conditions of a pot experiment, superphosphate applied on the surface or at levels down to 3 inches, is effective in promoting increased yields of rye grass on a limed or dolomited brown laterite soil and the recovery of phosphate is not greatly influenced.

Where basic materials have not been applied, recovery of phosphate is greatest when the phosphate is placed at 1 inch depth, but recovery is still satisfactory from phosphate at the 3 inch level.

The results obtained in placement experiments in pot are largely influenced by soil water conditions which permit a felt of roots to develop on the surface of the soil. Superphosphate in contact with moist soil for three months prior to planting is largely fixed by the soil and is of little value to plants.

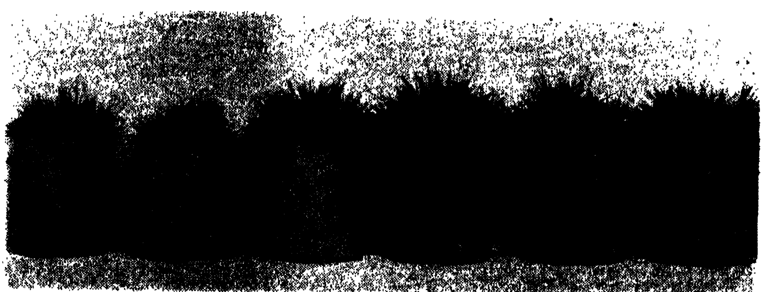
In a field experiment on the native brown laterite, superphosphate applied on the surface of the unlimed soil proved of no value, and little improvement in growth resulted when it was applied on the surface of limed or dolomited plots. Under all conditions of



G. H. I. J. L. M.

Phosphate Placement in Limed Soil—at First Cut.

G.—3 tons lime per acre.
H.—3 L + 4S, surface.
I.—3 L + 4S, 1 inch.
J.—3 L + 4S, 2 inches.
L.—3 L + 4S, 3 inches.
M.—3 L + 2S, 3 inches.



K. N. O. P. Q. R.

Phosphate Placement in Acid Soil—at First Cut.

K.—2 tons cement, per acre.
N.—Control (NK only).
O.—4S, Surface.
P.—4S, 1 inch.
Q.—4S, 2 inches.
R.—4S, 3 inches.

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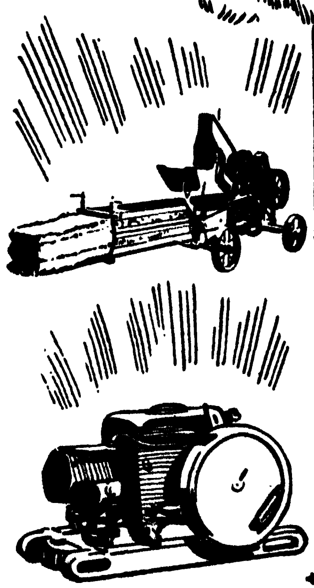

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the experiment, placement of superphosphate at 1 inch depth was most effective, but placement down to 3 inches gave satisfactory results on the limed and dolomited soils. Placement of 4 cwt. per acre application of superphosphate at 3 inches in soil receiving no basic material gave poor results and 2 cwt. application at the same depth was entirely without useful effect.

Liming or dolomiting confers much greater freedom in the placement of phosphate when rye grass is seeded on this soil.

In the field experiment the phosphate content of the grass at flowering was at the minimum of 0.2 per cent. P_2O_5 required for growth—a level of phosphate nutrition attained in the second growth of grass in the pot experiment.

The yield of rye grass in the field trial was poor on treatments receiving no phosphate, or basic materials alone, as it was in the pot experiments up to the first cut. In the pot experiment, however, good growth took place on these treatments during the second growth period.

The recovery of applied phosphate was low in the field experiments, due to the opportunity for fixation by the soil when plants remained static as a result of the onset of cold weather soon after germination.

Granule size of superphosphate, as previously found, appeared to be of little importance in the brown laterite.

Drought Relief for Cereal Growers.

Application forms for drought relief to cereal growers are now available from branches of the Rural Bank in affected areas.

Referring to the provision of drought relief as recently announced by the Premier, the Minister for Agriculture, Mr. Graham, said that administrative arrangements were now well in hand and payments were now being made by the Rural Bank.

Growers of wheat, barley, oats and wheaten and oaten hay who received relief last year and harvested less than 6 bushels per acre for the 1945-46 season would be eligible to participate again this year.

Growers who did not participate last year would be entitled to relief under the present scheme if the average yield of their crops over the previous three seasons was less than 12 bushels per acre and was less than 6 bushels per acre for the 1945-46 season.

The closing date for receipt of applications was 31st August.

Payment would be calculated on the unit of loss basis, which was successfully employed in respect of last year's distribution. By employing this basis, anomalies were avoided, and the funds were distributed equitably.

Sulphate of Ammonia.

Distribution System Modified.

In future, fertiliser manufacturers and distributors will be responsible for equitable distribution among their clients of available supplies of sulphate of ammonia and of mixed fertilisers containing this nitrogenous fertiliser.

Announcing this modification of the method of distributing sulphate of ammonia and of mixed fertilisers containing sulphate of ammonia, the Minister for Agriculture (Hon. E. H. Graham, M.L.A.) said that his Department no longer required individual growers to submit completed application forms to their retail suppliers when making purchases.

The system under which certain crops received priority for supplies of sulphate of ammonia would no longer be continued, and each distributor would be responsible for apportioning his supply of sulphate of ammonia for the year ended 30th June, 1947, between all producers of food crops. The Department of Agriculture would ensure that distributors received their quotas from manufacturers, said the Minister.

During the past three years, some fruitgrowers had been permitted to purchase sulphate of ammonia, but had not been permitted to purchase supplies of mixed fertiliser containing sulphate of ammonia for their trees. Such growers could now purchase mixed fertilisers instead of sulphate of ammonia if they so wished.

Mr. Graham stated that larger quotas of sulphate of ammonia had been allowed to fertiliser manufacturers this season, in addition to which supplies of nitrate of soda were also available. Supplies of nitrogenous fertilisers should thus be adequate to meet growers' reasonable requirements.

Farmers should address all inquiries for these fertilisers to their usual fertiliser agents. Inquiries regarding the sale of sulphate of ammonia for purposes other than the production of food crops must be addressed to the Fertiliser Rationing Officer, Department of Agriculture, Box 36A, G.P.O., Sydney.

SUPERPHOSPHATE FOR 1946-47 SEASON.

Further Improvement in Available Supplies.

ANNOUNCING that a further increase would be made in supplies of superphosphate to be sold in New South Wales next season, the Minister for Agriculture (the Hon. E. H. Graham, M.L.A.) said that his Department had been successful in obtaining a quota of 176,250 tons of superphosphate for use in the twelve months ending 30th June, 1947. This would be distributed in the usual way through the wholesale fertiliser trade whose ready assistance and co-operation during the difficult years when superphosphate was in very short supply was greatly appreciated.

"Distribution will again be supervised by my Department," said the Minister. "A close watch will be maintained on the fertiliser situation throughout the year, but with greater supplies available, the Department of Agriculture will be concerned principally with the prevention of excessive buying by individuals, assistance in the matter of superphosphate supplies to ex-servicemen and in assessing claims from growers who have not regularly used superphosphate previously."

Certain conditions would still be necessary in the sale of superphosphate, added Mr. Graham, but these had been made as few as possible, and were imposed to protect the interests of wheat growers and farmers in general. The following conditions would apply:—

Coastal Districts.—Sales of superphosphate may be made without completing an application form.

Tableland and Inland Districts:

1. Growers who received a "quota" last year—

   (*a*) Growers desiring to purchase up to 10 tons of superphosphate may do so by merely lodging an order with their supplying company.

   (*b*) Growers desiring to purchase more than 10 tons are permitted to do so to the extent of 20 per cent. above their last year's quota.

2. Growers who received a special ration last year—

   Farmers who last year received a special ration for dairying, pig raising, irrigated pastures, vegetable growing or green manure cropping in orchards, in tableland and inland areas, may purchase the same amount this year for these purposes in addition to any ration to which they are entitled under 1 (*a*) and (*b*), except that, where the total quantity purchased last year was less than 10 tons, the maximum quantity which they will be permitted to purchase this year will be 10 tons for all purposes.

3. New users—

   Agents and distributors shall supply under the abovementioned terms only those clients whom they supplied last year. New users, *i.e.*, returned servicemen and others who did not purchase superphosphate in either of the last two years, may purchase up to 5 tons per annum without lodging any application. Where a quantity in excess of 5 tons is required, it will be necessary for a special application to be made on forms which are obtainable from Fertiliser Agents.

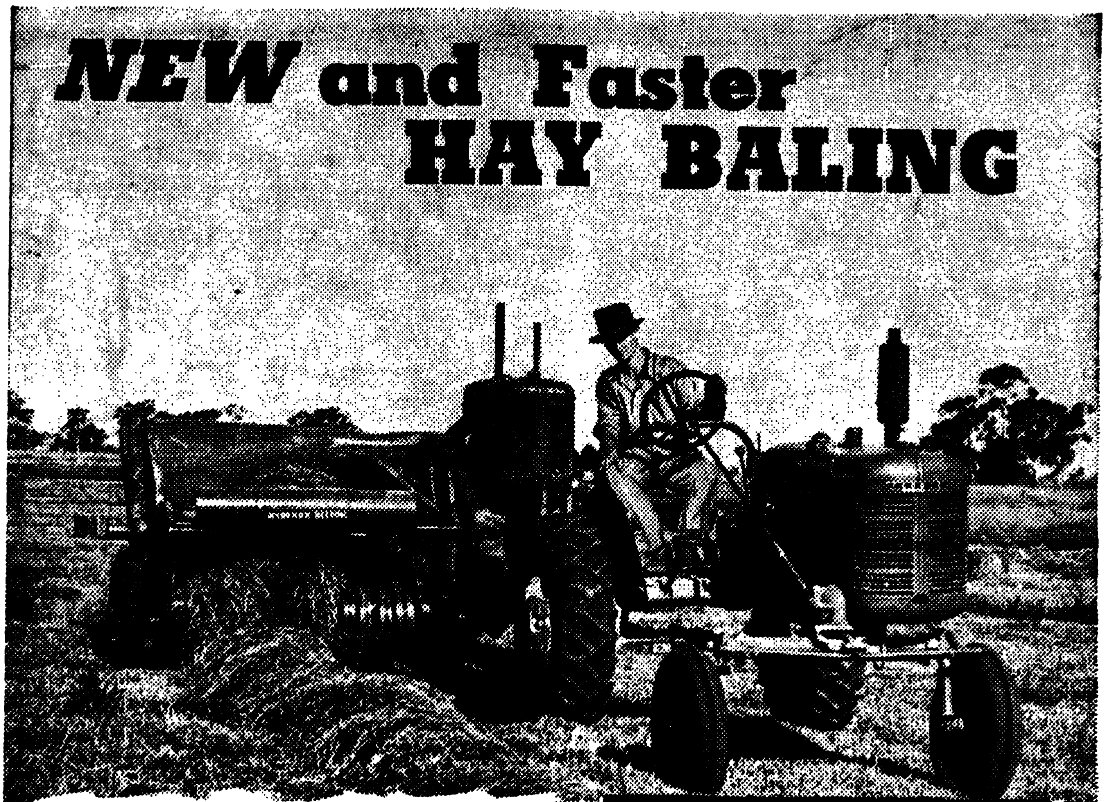
Any grower requiring further information regarding supplies of superphosphate should make application to the Fertiliser Rationing Officer, Department of Agriculture, through his local Fertiliser Agent.

Approved Seed—August, 1946.

To assist in the production and distribution of approved seed of recommended varieties of crops and vegetables, the Department publishes in this list each month the names and addresses of growers of such seed.

Cauliflower—

Shorts—H. Burton Bradley, Sherwood Farm, Moorland.


NEW and Faster
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MAIZE VARIETY RECOMMENDATIONS
For 1946 Sowing.

W. D. KERLE, H.D.A., Special Agricultural Instructor.

SOWING the right variety at the right time and using only sound, bright, pure seed from a reliable source, are axioms in maize growing.

It is essential to success that only varieties suited to the district should be sown, and growers are recommended to use those set out below for grain and green fodder in the various maize-growing districts of the State. These recommendations are based on trials which have been conducted by the Department for a number of years in co-operation with farmers in these districts.

Growers are advised to make early arrangements for seed supplies, and if in doubt as to which variety to sow to communicate with the Department or get into touch with the local Agricultural Instructor.

Hybrid Maize.

Many inquiries are being made for hybrid seed maize. A maize hybrid is not a fixed variety of maize and it takes many years of painstaking breeding, selection and field testing to produce hybrid types suitable for different localities. It will be some years before hybrids will be released from Experiment Farms, and until then growers should either adopt sound seed selection methods to maintain the yielding ability of their variety or secure their seed from reliable pure seed growers.

Approximate Order of Maturity of Varieties Recommended.

Very Early.—Early Morn, Golden Glow.

Early.—Wellingrove, Duncan, Golden Superb, Iowa Silvermine, Funk's Yellow Dent, Large Goldmine, Hawkesbury White.

Midseason. — Hickory King, Leaming, Golden Nugget, Golden Beauty, Murrumbidgee White, Manning Silvermine, Giant White, Manning Pride.

Late. — Yellow Hogan, Fitzroy, Large Red Hogan, Pride of Hawkesbury.

Varieties Recommended for Grain.

UPPER NORTH COAST.

(*a*) *Tweed River.*

Early Sowing.—Leaming, Wellingrove.

Main Sowing.—Fitzroy, Manning Pride.

(*b*) *Lower Richmond River.*

Early Sowing. — Leaming, Golden Superb.

Main Sowing.—Fitzroy.

Second-class Soils.—Hickory King.

(*c*) *Upper Richmond River.*

Early Sowing.—Leaming, Fitzroy.

Main Sowing.—Fitzroy.

(*d*) *Clarence River.*

Early Sowing.—Leaming, Golden Nugget.

Main Sowing.—Fitzroy, Golden Nugget, Golden Superb.

Late Sowing.—Golden Superb.

Second-class Soils.—Hickory King.

(*e*) *Coramba District.*

Early Sowing.—Leaming, Golden Superb.

Main Sowing.—Fitzroy, Leaming, Golden Superb.

Second-class Soils.—Hickory King.

(*f*) *Bellinger River.*

Early Sowing. — Leaming, Golden Superb, Iowa Silvermine.

Main Sowing. — Fitzroy, Giant White, Golden Superb.

Second-class Soils.—Hickory King.

(*g*) *Dorrigo District.*

Main Sowing.—Leaming, Grace's White.

Sowing after Potatoes.—Golden Superb.

(*h*) *Ebor District.*

Main Sowing.—Wellingrove.

MIDDLE NORTH COAST.

(*a*) *Nambucca River.*

Early Sowing.—Golden Superb, Leaming.

Main Sowing. — Giant White, Fitzroy, Golden Superb.

Second-class Soils.—Hickory King.

(*b*) *Lower Macleay River.*

Early Sowing.—Golden Superb.

Main Sowing.—Fitzroy, Yellow Hogan, Leaming, Giant White.

(*c*) *Upper Macleay River.*

Early Sowing.—Golden Superb.

Main Sowing.—Fitzroy, Yellow Hogan, Leaming, Golden Beauty, Hickory King, Giant White.

(*d*) *Hastings River.*

Early Sowing.—Golden Superb.

Main Sowing.—Fitzroy, Golden Beauty, Golden Nugget, Leaming, Hickory King, Giant White.

(*e*) *Lower Manning River.*

Early Sowing.—Golden Superb.

Main Sowing.—Fitzroy, Leaming, Manning Silvermine, Giant White.

(*f*) *Upper Manning River.*

Early Sowing.—Golden Superb.

Main Sowing.—Fitzroy, Leaming, Manning Silvermine, Giant White, Manning Pride.

(*g*) *Comboyne and Bulga Districts.*

Main Sowing.—Golden Superb, Leaming, Hickory King, Golden Nugget.

(*h*) *Wallamba District.*

Early Sowing. — Golden Superb, Iowa Silvermine.

Main Sowing. — Giant White, Fitzroy, Golden Nugget, Leaming, Manning Silvermine.

CENTRAL COAST.

(*a*) *Gloucester District.*

Early Sowing.—Golden Superb.

Main Sowing. — Fitzroy, Hickory King, Leaming, Giant White, Golden Nugget.

(*b*) *Lower and Central Hunter River.*

Early Sowing. — Golden Glow, Golden Superb, Duncan.

Main Sowing.—Leaming, Funk's Yellow Dent, Fitzroy, Golden Nugget.

Late Sowing.—Golden Glow.

(*c*) *Hawkesbury River.*

Early Sowing.—Golden Superb, Leaming.

Main Sowing. — Fitzroy, Yellow Hogan, Manning Silvermine, Pride of Hawkesbury, Hawkesbury White.

(*d*) *County of Cumberland.*

Early Sowing. — Hickory King, Wellingrove, Golden Superb.

Main Sowing.—Fitzroy.

SOUTH COAST.

(*a*) *Illawarra District.*

Early Sowing. — Funk's Yellow Dent, Iowa Silvermine.

Main Sowing.—Large Red Hogan, Fitzroy, Yellow Hogan, Giant White.

(*b*) *Shoalhaven River.*

Early Sowing. — Golden Superb, Iowa Silvermine.

Main Sowing.—Leaming, Hickory King, Giant White, Fitzroy.

(*c*) *Milton District.*

Early Sowing. — Funk's Yellow Dent, Iowa Silvermine, Duncan.

Main Sowing. — Fitzroy, Leaming, Hickory King, Golden Nugget.

(*d*) *Moruya River.*

Early Sowing. — Golden Superb, Early Morn.

Main Sowing.—Leaming, Funk's Yellow Dent, Golden Superb, Hickory King, Giant White.

(*e*) *Bodalla District.*

Early Sowing.—Golden Superb.

Main Sowing. — Funk's Yellow Dent, Golden Nugget, Hickory King.

Upland Soil.—Hickory King.

(*f*) *Bega and Pambula Rivers.*

Early Sowing. — Early Morn, Golden Superb.

Main Sowing. — Funk's Yellow Dent, Leaming, Giant White.

Upland Soils.—Hickory King.

(*g*) *Towamba River.*

Main Sowing.—Golden Superb, Golden Nugget, Leaming, Hickory King, Funk's Yellow Dent.

Upland Soils.—Hickory King.

NORTHERN TABLELAND.

(*a*) *Tenterfield District.*

Hickory King, Wellingrove, Large Goldmine, Iowa Silvermine.

(*b*) *Glen Innes District.*

Strong Soils.—Wellingrove.

Light Soils. — Iowa Silvermine, Large Goldmine, Golden Superb.

(*c*) *Ben Lomond, Llangothlin, Guyra, and Black Mountain Districts.*

Golden Glow.

(*d*) *Armidale District.*

Wellingrove, Large Goldmine, Golden Glow, Early Morn.

(*e*) *Uralla District.*

Hickory King, Large Goldmine, Wellingrove, Golden Glow, and Early Morn.

CENTRAL TABLELAND.

(*a*) *Mudgee District.*

Funk's Yellow Dent, Leaming, Golden Superb, Hickory King.

(*b*) *Colder Districts* (*Orange, etc.*).

Early Morn, Golden Glow.

SOUTHERN TABLELAND.

Moss Vale District.

Golden Glow, Early Morn, Hickory King, Golden Superb.

NORTH-WESTERN SLOPES.

(*a*) *Inverell District.*

Heavy Soils. — Funk's Yellow Dent, Wellingrove.

Light Soils.—Wellingrove, Iowa Silvermine.

Late Sowing. — Early Morn, Golden Glow.

(*b*) *Tamworth and Upper Hunter Districts.*

Early Sowing. — Early Morn, Golden Glow.

Main Sowing.—Wellingrove, Funk's Yellow Dent, Golden Superb.

CENTRAL-WESTERN SLOPES.

Alluvial Soils. — Funk's Yellow Dent, Iowa Silvermine.

Upland Soils.—Iowa Silvermine.

SOUTH-WESTERN SLOPES.

(*a*) *Tumut District.*

Main Sowings.—Murrumbidgee White, Funk's Yellow Dent, Iowa Silvermine, Golden Superb.

(*b*) *Gundagai District.*

Funk's Yellow Dent, Murrumbidgee White, Golden Glow, Golden Superb.

MURRUMBIDGEE IRRIGATION AREA.

Funk's Yellow Dent, Fitzroy, Hickory King, Iowa Silvermine.

Varieties Recommended for Green Fodder and Silage.

UPPER NORTH COAST.

Fitzroy, Hickory King (second-class soils only).

DORRIGO DISTRICT.

Leaming, Iowa Silvermine.

MIDDLE NORTH COAST.

Fitzroy, Hickory King (second-class soils only), Golden Nugget, Leaming, Golden Beauty.

CENTRAL COAST.

Fitzroy, Golden Nugget, Hickory King, Iowa Silvermine.

SOUTH COAST.

(*a*) *Illawarra District.*

Fitzroy, Pride of Hawkesbury, Hickory King, Golden Nugget.

(*b*) *Shoalhaven River.*

Fitzroy, Pride of Hawkesbury, Hickory King, Golden Nugget.

(*c*) *Milton District.*

Fitzroy, Duncan, Golden Nugget, Hickory King.

(*Continued on page* 443.)

FRUIT GROWING.

APPLE GROWING IN NEW SOUTH WALES.

H. BROADFOOT, Chief Fruit Instructor, and E. C. WHITTAKER, Fruit Instructor.

THE pioneering phase in apple growing, as in other rural pursuits, is passing in New South Wales, and as it passes it leaves clearly defined indications which cannot be ignored as to the way the industry should be developed. The testing period of the past has disclosed that we have some good apple districts, but it must be recognised—if we are to be truly wise after the event and to benefit from our experience—that it does not pay to attempt the commercial production of apples in unfavourable climatic zones.

The emphasis on districts in these introductory remarks is intentional, because it is believed that the future stability of apple growing in this State depends very largely on making the best use of our favoured areas and avoiding those which have been proved to be marginal. The best use of good apple growing country means not only confining new plantings to it, but includes the adoption on established orchards of soil management practices which are known to conserve soil fertility.

It is now clear that certain districts possess advantages of soil and climate for the production of late maturing, long keeping apples, suitable not only for the local market, but also in normal times, for export. On the other hand, there are areas eminently suited for the production of the better-class early apples—both dessert and cooking varieties—to meet the demand during the early portion of the year on the Sydney market.

It must be recognised that New South Wales provides an important market for apples from other States of the Commonwealth which produce considerably larger quantities, and in normal times such competition is a very important factor bearing on the success of the industry here. However, the best of our produce can meet such competition on more than equal terms and usually commands premium prices.

It is, therefore, essential to the continued success of apple growing in this State that the quality of the product be given priority of consideration and in this respect every natural factor which will help in maintaining such quality must be used to advantage.

It is contended then, that any expansion of the industry should be, as far as possible, confined to those areas which, over the years, have shown that by reason of their particular climatic and soil conditions, they are best suited to the production of first-class quality fruit, always keeping in mind the fact that some areas are best suited to the growing of early varieties solely for the local market, whilst others are more suited to the later long keeping sorts essential for cool storage and export.

Apart from the matter of suitable districts, the prospective apple grower is strongly advised to consider the present-day trends in Australian agriculture generally, which tend towards larger productive units specialising in one or two products, and on which full advantage can be taken of mechanical aids to production.

Fig. 1.—Fourteen-year-old Granny Smith Apple Trees Growing under Good Conditions in the Batlow District. [Photo by R. D. Meaker.

Although the apple is long lived, there always comes a time sooner or later when the trees reach such a stage as to make the continued working of them uneconomic, hence long range stability on individual orchards and throughout the industry is impossible without the planting of young

trees from time to time in anticipation of the decline of older trees. Sufficient land to provide for this, is therefore, an essential factor to consider when purchasing the original holding.

Those who are already engaged in some form of farming, and who may think of apple growing as a "nice little sideline" are advised to think carefully over the foregoing remarks on districts and areas, and to consider the fact that they will be competing with men of skill and experience, with areas large enough to enable the best use of labour and full-scale equipment, and in addition often backed by concerns specialising in the marketing of their products and in the supply of orchard requisites.

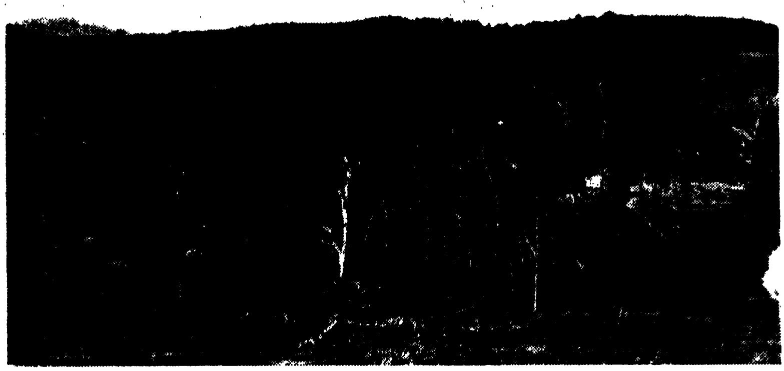

Fig. 2.—Good Virgin Apple Land in the Batlow District.
[Photo by R. D. Meaker.

Fig. 3.—"A Climate ......Cold in Winter."

Suitable Districts.

The apple was originally native to the more temperate parts of Europe and Asia, and although during centuries of cultivation and selection we have succeeded in vastly altering the original types, we have not altered in any marked degree this fruit's preference for its original natural environment; hence it still remains essentially a cool climate fruit.

Apple trees will grow and produce in a multitude of diverse situations, and under all manner of conditions, but the commercial grower of to-day is faced with the problem of growing, in quantity, consistent crops of high quality fruit; hence any advantage to be gained in exploiting favourable natural conditions of climate and soil must be availed of to the fullest extent.

In view of prospective competition from other States, little encouragement can be given to the growing of apples in anything except the most favourable localities, except perhaps in odd places catering for a purely local market.

The three essentials of a first-class apple producing district can be summed up broadly as follows:—

1. A climate mild in summer and cool to cold in winter.

2. An average rainfall of not less than, and preferable more than, 28 inches per annum, a fair proportion of which should be suitably spread over summer and early autumn.

3. A reasonably fertile, well-drained and deep soil.

The three essentials go hand in hand, and if one or the other is missing in a particular area, then apple growing in that area becomes more of a gamble than a business.

Only three of our major apple-growing districts comply with all three of the requirements as set out above, and the fact that these areas produce the most consistent crops is no mere coincidence. These three districts are Orange, Batlow and Armidale. Owing to the geographical position of these areas each district is well situated for supplying the Sydney market with apples. In addition, Orange can supply the western, Batlow the southern, and Armidale the northern towns in New South Wales. Armidale is situated about the same distance from Brisbane as from Sydney by rail, and so is well placed for supplying both of these markets.

The areas mentioned above are all "late" districts, *i.e.*, their particular climatic factors make them eminently suited to the growing of the late-maturing and mid-season varieties essential for cool storage and export.

Early apples grown in such areas mature at a period when they are almost certain to meet strong competition from better varieties grown in earlier districts, and generally speaking there is no case for the encouragement of planting early varieties in such areas.

Apples which possess the inherent ability to mature fruit quickly should be grown in an environment which favours such early maturity. The early districts, of which Oakdale is a good example, cater essentially for the local market and expansion in them should only proceed as the local demand for fruit of this type increases.

Considerable advantages to growers in more or less compact growing areas become apparent when one considers the very important part played in present day marketing of apples by cool stores, central packing houses, bulk cooling and buying systems, etc., all of which play a very important part in cutting production cost and marketing produce to the best advantage.

Producers in small isolated areas—even if they are located in favoured pockets—frequently lack access to such facilities, as well as the fund of local knowledge which, in the larger apple growing communities, has usually been built up during their development, and which can very often be of much assistance to a newcomer in the industry.

Fig. 4.—Portion of the Batlow District. [Photo by R. D. Meagher.


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Fig. 5.—A View of Batlow, showing the Packing Shed, Cool Stores, By-products' Factory, etc.
[Photo by R. D. Meaker.

The isolated grower is also likely to encounter labour difficulties, especially when it is necessary to employ skilled men for such jobs as pruning, packing, grading, grafting, etc. Any extra expense incurred in this direction and also, for instance, in transport to and from rail, puts him to so much more disadvantage in competition with the larger and more favoured areas.

(To be continued.)

ORANGE ROOTSTOCK TRIAL AT NARARA.

Results of First Six Years.

R. J. BENTON, Special Fruit Instructor, and F. T. BOWMAN, Ph.D., B.Sc.Agr., Special Fruit Research Officer.

ROUGH lemon is the main rootstock used for the citrus of different varieties producing some two million bushels of fruit within a 30-40 mile radius of Gosford. Whilst the normal source of rough lemon seed for citrus rootstocks is Norfolk Island, several other sources are available in New South Wales, and the question arose to some extent in pre-war years, and more particularly during the war years, whether local seed was as useful as Norfolk Island seed.

Tests at Narara Nursery for some years had indicated that approximately equally vigorous trees were produced in the nursery row on rough lemon rootstocks, the seed of which was obtained from diverse sources in New South Wales as well as Norfolk Island.

Two sources of rough lemon, worked to Valencia and Washington navel, were selected for a field trial at the Nursery. In the first six years of the trial no significant difference has been found in growth or fruiting between the trees on these two stocks in either variety.

In this trial sweet orange rootstock has proved significantly inferior as regards growth and fruiting during the same period. This applies to both varieties of oranges. The detailed results are given in Table I.

Details of the Experiment.

The experiment is located on undulating ground of sandy character, typical of citrus-growing country in the Gosford-Wyong area.

The area is contour-planted and, as such, has provided an excellent demonstration of this soil conserving practice. Figure I gives a view of the planting in 1943 and clearly shows that a shower of rain has converted each furrow into a rill for separately carrying the rain water *across* the land, thereby enabling better penetration of rain, and avoiding soil erosion. Heavier run-off is adequately carried away by the "finish-out" between each row of trees.

The trial consists of Valencia on the higher ground and Washington Navel on the lower ground worked on to rough lemon seedlings (Norfolk Island and a local source) and sweet orange seedlings raised from a very large tree growing at Moorland. These three treatments form a block,

each block being replicated six times. There are six trees per treatment or plot. Thus, there is a total of 36 Valencia on each stock, the same of Washington Navel, and the whole is surrounded by a guard row.

TABLE I.—Growth and Yield of Valencia and Washington Navel Oranges on Rough Lemon and Sweet Orange Rootstocks, 1939, (at planting) to 1945, at Narara Nursery.

YEAR.	ROOTSTOCK. Maitland Rough Lemon.	Norfolk Is. Rough Lemon.	Sweet Orange.	Difference for Significance.
VALENCIA ORANGE.				
Mean Trunk Circumference (cm.)				
1939	2·82	2·85	2·84	——
1940	5·12	5·29	4·36	0·27
1941	9·31	9·53	7·80	0·57
1942	13·81	14·39	11·52	1·27
1943	17·91	18·67	14·92	1·94
1944	22·18	23·28	19·00	2·12
1945	25·69	27·21	21·73	2·65
Mean Yield (lb.)				
1944	24·8	31·3	11·9	11·2
1945	Very light yields throughout—not recorded.			
WASHINGTON NAVEL ORANGE.*				
Mean Trunk Circumference (cm.)				
1939	2·77	2·83	2·66	——
1940	5·14	5·05	4·48	0·27
1941	9·73	9·30	8·42	0·48
1942	12·93	12·40	11·43	0·92
1943	16·24	15·34	13·73	1·30
1944	19·26	18·58	16·50	1·55
Mean Yield (lb.)				
1943	13·2	14·4	7·2	4·8
1944	28·2	29·7	15·4	8·0

* Several Washington Navel trees were heavily cut back in 1944, consequently growth and yield measures are not presented for 1945.

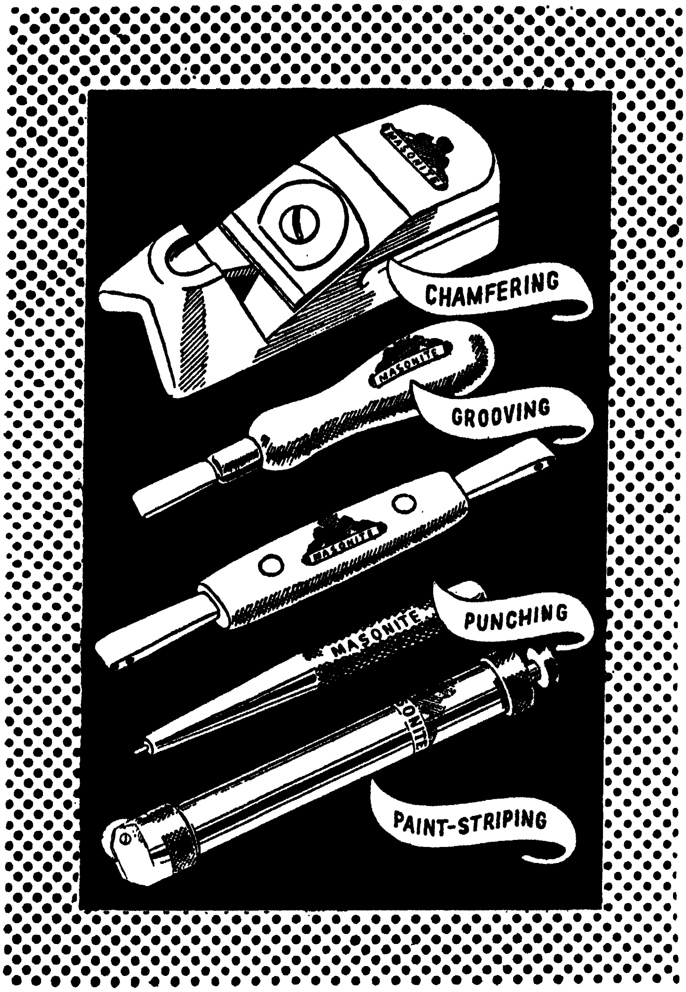
Rootstocks were raised and budded at the Nursery and only average representative trees were planted in the field trial.* They were planted in September, 1939. Girth measurements were then made and have been repeated since at a corresponding time each season. Girth is measured at a marked point 6 inches above the union. The trial has been subjected to a succession of unusually dry seasons. The rainfall during the period has been as follows (the figures in brackets indicating the number of inches above or below the 30-year average recorded at the Nursery):—

1938/39	36.53 in.	(— 8.87)
1939/40	26.73	(—18.67)
1940/41	43.45	(— 1.95)
1941/42	39.39	(— 6.01)
1942/43	39.63	(— 5.77)
1943/44	40.91	(— 4.49)
1944/45	45.42	(+ 0.02)

The authors wish to acknowledge the assistance of Mr. J. A. Ballantyne for the contour design of the block, the Superintendent of the Nursery for the care of the block, and of several officers of the Division of Horticulture who have helped with various phases of the work, as well as to acknowledge the contribution of Mr. F. C. McCleery in designing the experiment and statistical analysis of the results.

*Prior to planting, the young trees were measured (by circumference) and divided into size classes. The numbers required for the experiment were taken from the modal class and the classes on either side of the mode, thereby securing representative trees for the trial. Trees from the remaining classes were used in the guard row.

The Orange Rootstock Trial at Narara Nursery Planted on the Contour.



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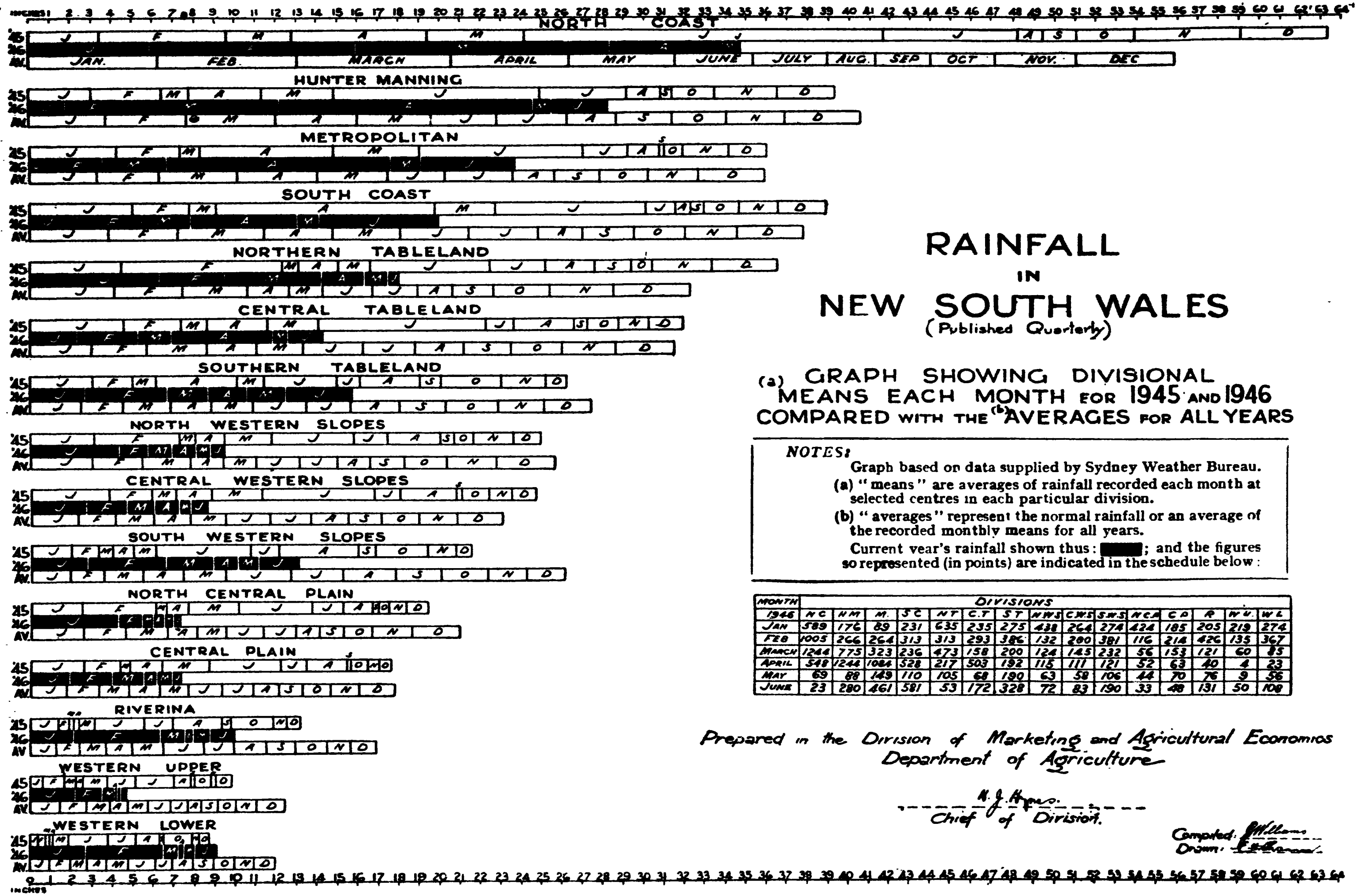
RAINFALL IN NEW SOUTH WALES

(Published Quarterly)

(a) GRAPH SHOWING DIVISIONAL MEANS EACH MONTH FOR 1945 AND 1946 COMPARED WITH THE (b) AVERAGES FOR ALL YEARS



NOTES:

Graph based on data supplied by Sydney Weather Bureau.

(a) " means " are averages of rainfall recorded each month at selected centres in each particular division.

(b) " averages " represent the normal rainfall or an average of the recorded monthly means for all years.

Current year's rainfall shown thus: ▬; and the figures so represented (in points) are indicated in the schedule below:

MONTH	DIVISIONS														
1946	N.C.	H.M.	M.	S.C.	N.T.	C.T.	S.T.	N.W.S.	C.W.S.	S.W.S.	N.C.P.	C.P.	R.	W.U.	W.L.
JAN	589	176	89	231	635	235	275	438	264	274	424	185	205	219	274
FEB	1005	266	264	313	313	293	386	132	200	381	116	214	426	135	367
MARCH	1244	775	323	236	473	158	200	124	145	232	56	153	121	60	85
APRIL	548	1244	1084	528	217	503	192	115	111	121	52	63	40	4	23
MAY	69	88	149	110	105	68	190	63	58	106	44	70	76	9	56
JUNE	23	280	461	581	53	172	328	72	83	190	33	48	131	50	108

Prepared in the Division of Marketing and Agricultural Economics Department of Agriculture

H. J. Hynes.
Chief of Division.

Compiled: [signature]
Drawn: [signature]

PLANT DISEASES.

Contributed by the Biological Branch.

CERTIFICATION OF FRENCH BEAN SEED.

THE certification scheme for French bean seed introduced mainly for the purpose of controlling certain serious seed-borne diseases, particularly the bacterial blight diseases, was continued during the 1945-46 season, which was the third successive year of operation of the scheme. In the past season, approximately 1,200 acres were inspected and 222 acres were passed for certification. Almost every bean seed crop on the South Coast was included in the inspections, although many were ineligible for certification because of the origin of the seed used for planting.

It is expected that about 2,900 bushels of dressed seed will be certified. Of this total about 55 per cent. will be Brown Beauty, 38 per cent. Hawkesbury Wonder and the remaining 7 per cent. will be made up of Tweed Wonder, Wellington Wonder and Canadian Wonder. After provision is made for the seed reserved for planting next season's seed crop, there should be available for green bean growers several hundreds of bushels of certified Brown Beauty and Hawkesbury Wonder Seed.

The certification scheme has not only been responsible for the production of seed of the standard required by the certification rules, but also for an improvement in the standard of uncertified seed. Thus, much of the uncertified Hawkesbury Wonder, Brown Beauty and Tweed Wonder seed produced in the past season will be almost equal in quality to certified seed. Indeed, some lines of uncertified seed of these varieties will be of certification standard, having been rejected for certification only because of technical points such as insufficient isolation or lack of rotation. The position with regard to uncertified Wellington Wonder and Canadian Wonder is not yet so satisfactory.

Halo Blight.

Alterations in Certification Rules.

As a result of further experience during the past season, some alterations have been made in the rules governing the certification of French bean seed. A copy of the revised rules has been sent to all bean seed growers of whom the Department has a record. Any grower interested in certified bean seed who has not received a copy may obtain one on application to the Department. In the 1946-47 season, it may again be possible to inspect for certification only bean seed crops on the South Coast.

The major requirements remain the same as in existence for the 1945-46 season—see *Agricultural Gazette* for August, 1945. These are that the seed crops should be absolutely free from halo blight (*Pseudomonas medicaginis* var. *phaseolicola*), American common blight (*Xanthomonas phaseoli*) and anthracnose (*Colletotrichum lindemuthianum*), reasonably free from mosaic, and of a satisfactory standard of varietal purity.

The main alterations in the certification rules are in respect to land eligibility and isolation.

Land Eligibility.—Previously a bean crop grown on land which carried a bean crop

American Common Blight. [*After Chupp.*

other than a certified or approved crop during the previous season, was ineligible for certification. Under the revised rules, land which carried a bean crop other than a certified or approved crop during the preceding season can be used for growing a certified seed crop if:—

(1) Sown not earlier than 15th November; and

(2) the preceding crop was grown from certified or other seed approved by the Department; and

(3) the preceding crop was not known to be affected with anthracnose or American common blight; and

(4) all bean stalks, pods, leaves and other trash from the preceding crop were burned and/or ploughed under not later than the preceding 30th June to the satisfaction of the local Agricultural Instructor.

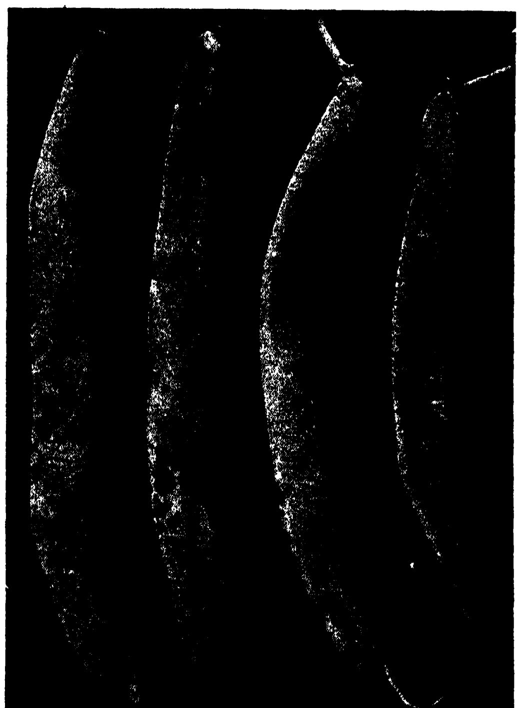
Isolation.—Previously an isolation distance of at least 110 yards from a rejected or ineligible crop was required. Under the revised rules, three isolation distances are set down, depending firstly on the number of plants in the ineligible or rejected crop which are affected with any of the three diseases for which a zero tolerance is laid down, and secondly on whether the intervening space is planted with a crop of maize, sorghum or other tall-growing crop. These three distances are:—

(1) Fifteen chains (330 yards) where more than 100 plants in any 1 acre of the ineligible or rejected crop are affected with any of the three diseases for which a zero tolerance is laid down;

(2) five chains (110 yards) where less than 100 plants in any 1 acre are so affected; and

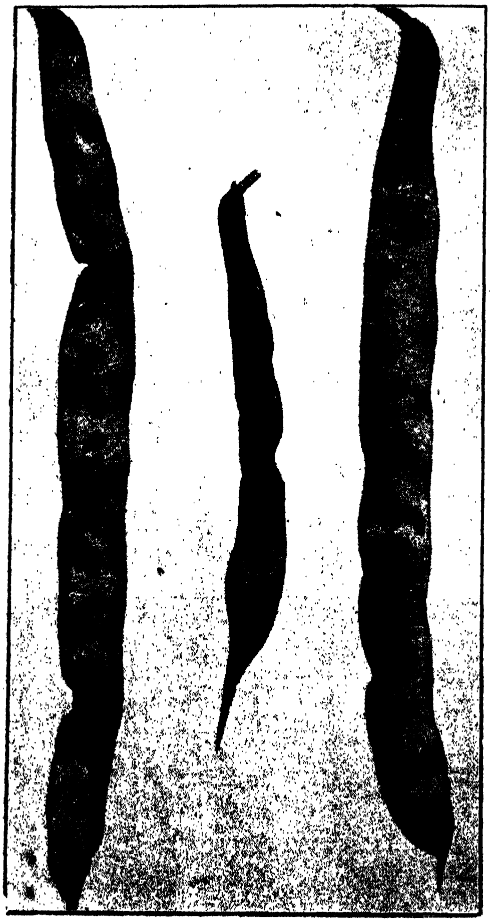
(3) two and a half chains (55 yards) where less than ten plants in any 1 acre of the ineligible or rejected crop are affected with any of the diseases for which a zero tolerance is laid down, and where the intervening space is planted with a crop of maize, sorghum or other suitable crop having a satisfactory density of stand and being at least 5 feet high at the time of the first field inspection.

In addition to the above alterations in respect to land eligilibity and isolation, there have also been alterations in the sections



Pods showing Dark Green, Water-soaked Areas caused by Halo Blight.
American Common Blight produces similar pod symptoms.

dealing with applications for inspection, seed origin, the tolerance for varietal impurities (reduced from 3 to 1 per cent.), harvesting, threshing, winnowing, cleaning, grading, sealing and tagging.



Black Sunken Spots caused by Anthracnose.

Present Status of Bean Seed Supplies.

Bean seed growers who wish to secure certified seed for planting their seed crops are advised to contact the Agricultural Instructor for their district concerning sources of supply. For the information of green bean growers, the following information is supplied as a guide to the status of seed grown in New South Wales last season of each of the five main varieties of dwarf French beans:—

Brown Beauty (Premier).—Several hundred bushels of certified seed of this variety will be available for green bean growers. Much of the uncertified seed produced will be of a very high standard in reference to freedom from disease, but there will be a few lines of New South Wales grown Brown Beauty seed on the market moderately to severely affected with the bacterial blight diseases.

Hawkesbury Wonder.—There will also be several hundred bushels of certified seed of this variety on the market. Hawkesbury Wonder is very resistant to halo blight and almost all lines of uncertified Hawkesbury Wonder seed will be of a high standard in reference to freedom from disease.

Tweed Wonder.—Except for a few bushels supplied to growers in the Gosford district, there will be no certified seed of this variety available for green bean growers. Most of the uncertified seed of this variety will be satisfactory in reference to freedom from disease.

Wellington Wonder.—No certified seed is likely to be available for green bean production. Except for a few lines, practically all the uncertified seed of this variety on the market will be moderately to severely affected with halo blight.

Canadian Wonder.—No certified seed of this variety is available for green bean growers. This variety now consists of a number of distinct strains. Some of the strains are fairly resistant and some very susceptible to halo blight. At least one of the Canadian Wonder strains is very susceptible to a wilt disease which, under hot conditions, can cause an almost total crop loss. The cause of this wilt disease has not yet been determined, although species of fungi of the genus *Fusarium* have been frequently found associated with it. Both because of this disease and the fact that some lines of Canadian Wonder are carrying a large amount of halo blight, the purchase of seed of this variety on the open market is liable to result in serious losses from disease in the subsequent crop.

A Summary.—The position at present is that the green bean grower is advised to obtain certified seed when this is available. If only uncertified seed can be bought, Hawkesbury Wonder is the safest variety to grow, but most lines of uncertified Brown Beauty and Tweed Wonder should be satisfactory. Unless something is known concerning the origin of the seed, there is a definite risk attached to buying seed of the varieties Wellington Wonder and Canadian Wonder.

INSECT PESTS.

Notes contributed by the Entomological branch.

The Australian Plague Locust.

(Chortoicetes terminifera).

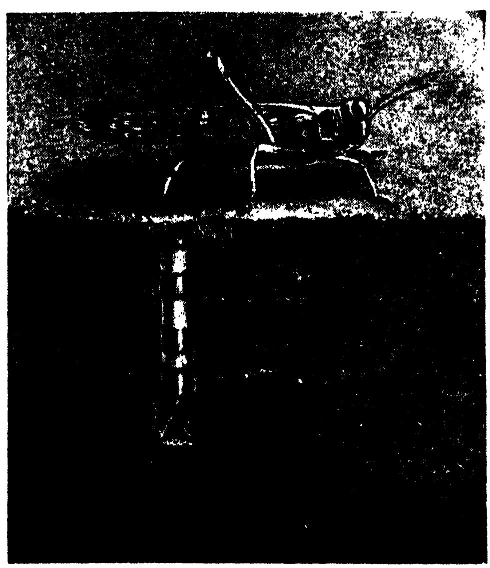
THE occurrence of swarms of winged adults of the Australian Plague Locust throughout the Central Division of this State and reports that they have laid extensively, indicate that a major infestation is likely to occur this spring.

Further reports have been received that limited hatchings of hoppers occurred in some areas during May and June. Adult locusts were also present during these months and some damage was caused by fliers and hoppers in the Urana-Corowa, Narrandera, Forbes and Young districts. Later reports have indicated that low winter temperatures have limited their activities and few are now in evidence. Further damage will not occur until the hatching of the overwintering eggs, which normally takes place in September.

In view of the present need for conserving all available food supplies a control campaign has been organised and will be put into operation should the threatened infestation occur. Central depots for the mixing of poison bran bait will be established, and it is the duty of all landholders to destroy swarms existing on their properties. Under the Noxious Insects Act the power to require the destruction of locusts is vested in the Pastures Protection Boards.

Locust outbreaks occur periodically throughout south-eastern Australia, the earliest recorded swarm appearing in 1844. In New South Wales these outbreaks involve mainly the Central Division and the Eastern Division west of the Dividing Range, and also the Hunter River Valley. The area infested is limited, apparently, by the distance from the permanent breeding grounds, known as outbreak centres, the presence of mountain or timber barriers and climatic conditions. A severe outbreak usually extends over two seasons, and at the end of the second season the swarms are mainly dispersed.

The Australian Plague Locust is a rather slender insect, the female of which measures about 1½ inches in length; its general body colour is usually brown, but is sometimes grey or green, with often a pale stripe down the middle of the back. Green forms are common in non-swarming populations, but rare in dense swarms. The males are somewhat smaller than the females and are never green. The species may



The Australian Plague Locust Constructing its Egg Tunnel.

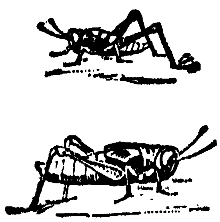
The egg tunnel is made by a process of digging and compression, and this is done by means of four hard ovipositor valves at the tip of the abdomen. The abdomen becomes greatly extended as the tunnel increases in depth. (*Actual size.*)

be recognised by the black tips to the otherwise transparent hind wings. The shanks of the hind or jumping legs are bright scarlet, except for the upper ends, which are cream-coloured.

Seasonal History.

The eggs are deposited in batches of thirty to forty, in holes made in the ground by the females, and it is not unusual to find 100 or more such holes per square foot. The eggs are surrounded by a secretion, which dries to form a frothy protective covering and also serves to cement the eggs into a single group, referred to as an "egg-pod." The egg-beds are usually confined to bare or scalded patches of compact soil, as distinct from the softer, self-mulching type which produces the vegetation necessary for the development of the locusts. These patches may vary from a few square yards in extent up to several hundred square yards, and such egg-beds may be irregularly scattered throughout an area. The eggs from a particular egg-bed may hatch simultaneously, or progressively over a period of several weeks.

Eggs of the Australian Plague Locust removed from the Egg-pod. (Actual size.)



Hopper Stages of the Australian Plague Locust.

Hatching occurs in September in the northern parts of the State with a gradual extension of time towards the south and east, and is completed by the end of October in the south-eastern sections. In the normal course of events, fliers appear in November or December, according to the locality in which they hatched. The period from the hatching of one generation to the hatching of the next is usually ten to twelve weeks, and consequently a second generation of fliers may be expected in January and February. However, December, January and February may be critical months, climatically, since lack of rain may interrupt further development. The exact time of such unfavourable dry weather is of the utmost importance, as developing hoppers may be destroyed in two to four weeks, whereas unhatched eggs in the soil may withstand drought periods of up to three months.

Consequently, a third generation can only be passed through if the summer drought is absent, or of brief duration, since development towards the end of the season is retarded by low autumn temperatures. Winged forms of the third generation may be expected in March and April and eggs laid by this generation of fliers usually overwinter, and give rise to the spring generation of hoppers. Under favourable conditions a partial fourth generation may hatch, and these late-hatched hoppers, together with winged adults, are often responsible for damage to crops in the autumn. In some seasons, and particularly in the northern sections of the State, both adults and hoppers may overwinter, and be sufficiently numerous to form early swarms in the spring, and cause damage to maturing crops.

As the seasonal history of the Australian Plague Locust is determined by the effects of temperature and rainfall, it is obvious that variations from the above schedule will result from unfavourable conditions, and also, that all regions liable to infestation, owing to regional differences in climatic conditions, will not be capable of producing the number of generations described above.

Control.

Two methods of control are recommended:—

(*a*) By the use of poisoned bran bait; and

(*b*) By spraying with an arsenite of soda solution.

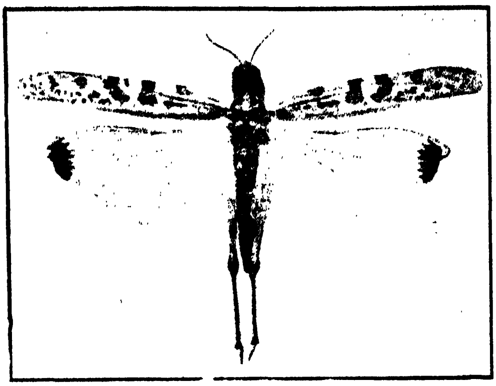
The latter method is equally as effective as poison bran baiting and is recommended where hoppers are feeding in heavy clover or other herbage. However, as the stirrup pump is the most readily available piece of equipment for applying the spray, excessive and dangerous quantities are likely to be used, and for this reason the bran bait has been generally adopted, because it is safe to use unless broadcast with gross carelessness.

The Poison Bran Bait.

The following directions are given for mixing bran bait:

The bait consists of—

Arsenite of soda (80 per cent. arsenious oxide content)	½ lb.
or	
Arsenite of soda (60 per cent. arsenious oxide content)	¾ lb.
Water	2½ gallons.
Molasses	4 lb.
Bran	24 lb.



The Australian Plague Locust.
Note the black tips on hind wings.
(*About actual size*). [*Photo after Cocks.*

Method of Preparation.—To prepare the bait, heat ½ gallon of water in a clean kerosene tin and dissolve the arsenite of soda in it. Add 2 gallons of cold water to make up the 2½ gallons required. Add the molasses to this arsenite of soda solution, and mix thoroughly by stirring, or pouring the mixture from one tin to another.

Weigh the bran, tip on to a wooden or concrete floor or into a large receptacle. Sprinkle the arsenite of soda and molasses solution from a tin or watering can on to the bran, and thoroughly mix with a shovel or other implement, taking care that the bait becomes uniformly moistened. The bait should be in a flaky, moist condition, and free from pellets.

A kerosene tin full (shaken down, not pressed down) holds approximately 12 lb. of bran. For molasses a large tin with marks to indicate quantities weighing 4 lb., 8 lb. or 16 lb. of molasses may be used as a measure. For the arsenite of soda it is more accurate to weigh out the quantities rather than to measure them.

Effective results have been obtained when molasses has been omitted from the poison bran bait formula, and in the absence of supplies of molasses, unsweetened bait may be used.

Sawdust has been used to replace half the bulk of the bran and the resultant bait has proved effective. Such a bait will spread more evenly, and so be economical, as bran baits are usually distributed too lavishly. If sawdust is used, it is preferable to obtain old, dry material which will readily absorb the poisoned liquid.

Method of Distributing the Bait.—Scatter the bait lightly over a strip a few feet wide immediately around the front of the advancing swarm, directly on to the massed hoppers, and, if the swarm is very deep, through the middle of the swarm. The direction of advance of the swarm is generally apparent, and onward movement can usually be arrested by a line of bait.

Approximately 20-40 lb. of dry bait, or 40-80 lb. of wet ready-mixed bait, according to the age and density of the hoppers and the grass cover on the area to be treated, will be sufficient to bait one acre of hoppers. The average swarm, however, is usually less than one acre in extent and would require 10 to 20 lb. of wet bait, while a swarm with a front of one-quarter of a mile may be effectively controlled with 100 lb. of wet bait. A moderately heavy distribution of 50 lb. of wet bait per acre is

Hoppers Halted and Massed at Line of Bait.

usually sufficient, and this may be gauged by walking along the front of the swarm and broadcasting a small amount of bait every two or three paces.

The bait should be picked up in half-handfuls with the fingers relaxed, as any squeezing of the bait will cause it to fall in lumps or pellets. When broadcast the

bait should be scattered sparsely and evenly, and will be somewhat difficult to see on the ground.

The best time to scatter bait is early in the morning as the temperature rises and the hoppers commence to feed. In very hot weather the hoppers do not feed readily during the heat of the day and afternoon baiting has given excellent results. Under average conditions baiting can be carried out throughout the day provided that the hoppers are observed to feed on the bait. A test handful or two should be broadcast, and if the hoppers are seen to feed, baiting may proceed. Feeding on cold, windy or overcast days is negligible and baiting under such conditions is obviously useless.

Baiting should not be commenced until the young hoppers mass, preparatory to moving away from the egg-beds, and this may not occur for a week or ten days after the first hatching. In this way one baiting may be sufficient, whereas, if it were carried out too early, before the majority of the hoppers had emerged and massed, it would be necessary to rebait the area to poison late-hatching hoppers.

It is obvious that the bait need only be applied where the actual hopper swarms are massed and not over a whole paddock or district.

The bait will take effect within twelve to forty-eight hours, according to the size and age of the hoppers. An inspection should be made three days after baiting, and, if necessary, more bait broadcast where patches of hoppers have been missed or where the survivors have massed again into a dense band.

The Poison Spray.

The formula for the arsenite of soda spray, which may be used as an alternative to the poison bran bait, is as follows:—

Arsenite of soda (80 per cent. arsenious oxide content)	**1 lb.**
Molasses or treacle (preferably molasses)	**2 lb.**
Water	**16 gallons.**

Dissolve the arsenite of soda in some hot water in one vessel, and the molasses also in warm water in another vessel. Allow the two solutions to cool before mixing them together and diluting to the correct strength.

The spray should first be applied on a strip of herbage a few feet wide immediately in front of the advancing hopper swarm, and then directly on to the swarm. The sprays kills partly by caustic action, but mainly because the hoppers drink the liquid or feed on the poisoned herbage. Spraying should only be light and about 75 to 80 gallons of spray per acre is quite sufficient. It is not necessary to waste material by drenching the herbage but merely to apply the spray as a fine mist. It has been proved by severe tests that the spray, made and applied as directed, is not harmful to sheep.

Necessary Precautions in Preparation and Use of Bait and Spray.

Keep the hands out of the arsenite of soda solution, and use sticks for stirring.

Before commencing to distribute bait, rub the hands with vaseline or grease. Soap may be worked under the nails by scraping the cake and this will prevent flakes of poisoned bran from lodging there and causing irritation. Wash the hands carefully after completing the work.

Do not allow any bait to lie about in tins or on the ground in lumps; it is attractive to stock and might poison them. Spillage of the molasses-sodium arsenite mixture is also to be avoided if stock have access to the mixing sites. This material soaks into the ground and subsequent rains may form poisoned pools which will be readily sought by stock.

Upon completion of the season's work, thoroughly wash in hot water all receptacles used, and burn all bags. Any arsenite of soda left over should be carefully stored away in a safe place.

Bait scattered carefully as directed and not in pellets is not a danger to stock, and no authenticated cases of bird poisoning have occurred in spite of numerous surveys and requests to landholders for dead birds to carry out tests for arsenical poisoning.

D.D.T. AS A CODLING MOTH CONTROL.

Experiments with Apples on Murrumbidgee Irrigation Area.

E. J. WASON, B.Sc.Agr., H.D.A., Entomologist.

THE main object of the experiment described below was to ascertain the efficiency of D.D.T. as an emulsion, for the control of codling moth, and to observe its effects on tree and fruit growth. Observations were also made on the effect of D.D.T. on the incidence of other pests liable to attack pome fruit trees during the growing period. From the results it can be concluded that D.D.T. is only slightly more efficient than arsenate of lead on the Murrumbidgee Irrigation Area. While no spray injury from D.D.T. was observed, red spider and woolly aphid infestations greatly increased on trees treated with D.D.T., as compared with those given the standard treatment, and spraying with D.D.T. proved very much more costly.

The *spray treatments tested* were as follows:—

(A) D.D.T.—Solvent Naphtha emulsion at a concentration of 0.1 per cent D.D.T.

(B) Lead arsenate 3 lb. to 100 gallons, plus 1 gallon white oil in the first,* second and third cover sprays. Calcium-caseinate at the rate of 1 lb. was added to the lead arsenate in the "calyx" spray, and in the fourth and fifth cover sprays, white oil at the rate of 1 quart to every 100 gallons of lead arsenate spray was used.

(C) Same programme as used in (B), with the exception that D.D.T. solvent naphtha emulsion, was used in lieu of the lead arsenate for the second and fourth cover sprays on 12th November and 21st December respectively, following on the peak of emergence of the "spring" and the "first summer" brood moths respectively.

(D) Check. Unsprayed.

In general, weather conditions were hot and dry throughout the experiment; with the exception of two periods, viz., 25th to 30th October and 17th to 20th January, when 187 points and 153 points respectively were recorded. From the time of application of the calyx spray (20th October, 1945) up to the picking of fruit on 23rd January, 1946, a total of 453 points of rain was recorded.

During the period of the experiment three heat waves occurred, viz.—

(1) December 14th to 17th inclusive, when screen maximum temperatures registered were 104, 112, 109, 107, deg. Fahr.

(2) December 23rd to 26th inclusive, when the screen maximum temperatures recorded were 100, 102, 100, 100, deg. Fahr.

(3) January 10th to 15th inclusive, when screen maximum temperatures recorded were 103, 106, 104, 107, 109, 103 deg. Fahr.

* It was decided to use the white oil at a concentration of 1 per cent. in the first, second and third cover sprays instead of the second, third and fourth cover sprays, as is recommended, because of the late blossoming and the notable emergence of moth at the time, as indicated by lure traps.

Details of the Experiment.

The four treatments were arranged in four randomised blocks; thirty-two trees were used in the experiment each plot consisting of two trees. All the trees included in the test were Granny Smith apples planted in 1932.

The following are the dates on which the various sprays were applied:—

Calyx Spray—20th October, 1945.
First Cover Spray—30th October, 1945.
Second Cover Spray—12th November, 1945.
Third Cover Spray—4th December, 1945.
Fourth Cover Spray—21st December, 1945.
Fifth Cover Spray—10th January, 1946.

The time of application of the various cover sprays was based on moth activity as indicated by lure traps—see graph.

The sprays were applied with a most efficient power spray at a pressure of 300 lb. per square inch. Two nozzles were attached to each rod. It was found necessary to apply, on an average, 4 gallons of spray per tree in order to obtain a thorough coverage of foliage and fruit.

The unsprayed (check) trees were examined weekly from 23rd November until

harvest time in late January, 1946, when all infested fruits were removed from the trees and then destroyed after being examined and counted.

All fallen fruit, from both sprayed and unsprayed trees, was picked up once a week, examined, counted and then destroyed.

Moth Activity.

The overwintering brood of larvae commenced to emerge as spring brood moths on 9th October, 1945. Emergence was at its peak during the first week of November and was completed during the last days of that month.

Peak emergence of the first summer brood moths occurred during the period 11th to 18th December. Emergence of this brood extended over a period of eleven weeks from 4th December, 1945, to 19th February, 1946.

A limited or partial emergence of the second summer brood moths took place between 19th February and 3rd April—see graph.

Results.

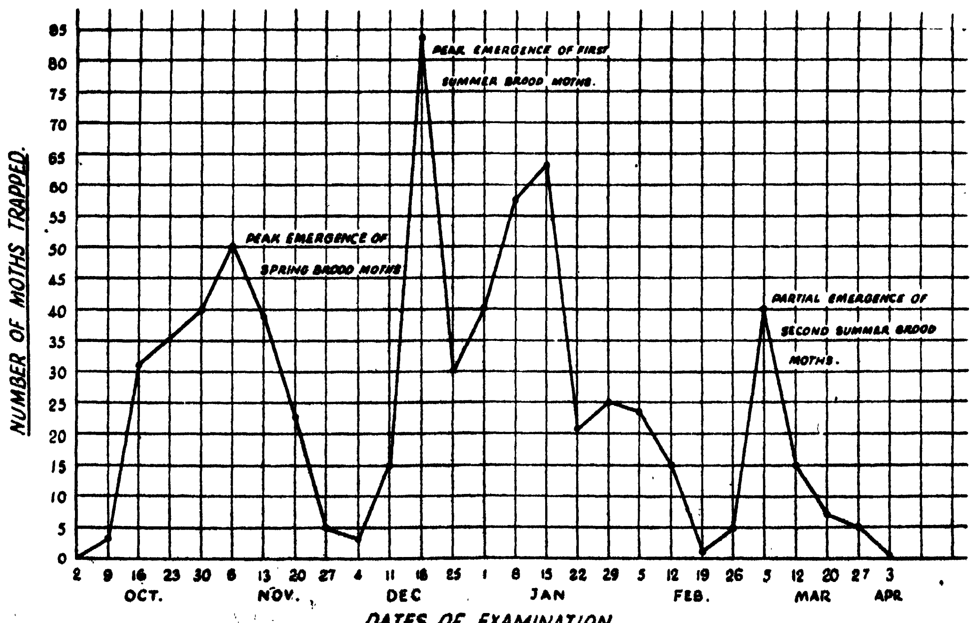
The results of the various treatments are set out in the accompanying table.

TABLE showing Results of Various Treatments.

Treatment.	Total No. of Fruit in Test.	No. of Sound Fruit.	No. of Infested Fruit.	No. of Stings.	Per cent. of Sound Fruit.	Per cent. Infested Fruit.	Per cent. of Stung Fruit.
A	6,089	6,002	49	38	98·6	0·8	0·6
B	5,626	5,385	128	113	95·7	2·3	2·0
C	5,016	4,876	84	56	97·2	1·7	1·1
D	7,000	3,145	3,813	42	44·9	54·5	0·6

The infested fruit on the various treatments was classified as side or calyx infestations and the results are set out in the following table.

Treatment.	Per cent. Side Infestation.	Per cent. Calyx Infestation.
A	100	Nil.
B	95·3	4·7
C	91·7	8·3
D	87·9	12·1



Graph showing Emergence of Codling Moth in the Field, as indicated by Lure Traps.

Observations.

The following observations were made during the period of the experiment.

The period of blossoming was prolonged; with the result that the calyx spray was applied seven to ten days later than usual.

While blossoming was late, moth emergence was normal.

The crop carried by the individual trees included in the experiment varied considerably, ranging from 165 to 1,348 fruits. Randomisation of the treatments overcame this factor to a large extent, the average number of fruits per tree being 761, 703, 627 and 875 respectively in treatments A, B, C and D.

Tree showing Leaf-fall due to Red Spider Infestation following D.D.T. Sprays.

Effect of D.D.T. on Tree and Fruit Growth.

Trees sprayed with D.D.T. emulsion throughout the season were closely examined at weekly intervals when the following observations were made.

(a) Foliage and developing fruit showed no noticeable signs of spray injury. Foliage growth during October, November and December compared most favourably with that of the unsprayed check trees. The foliage did not become harsh as happened when the trees were sprayed with lead arsenate.

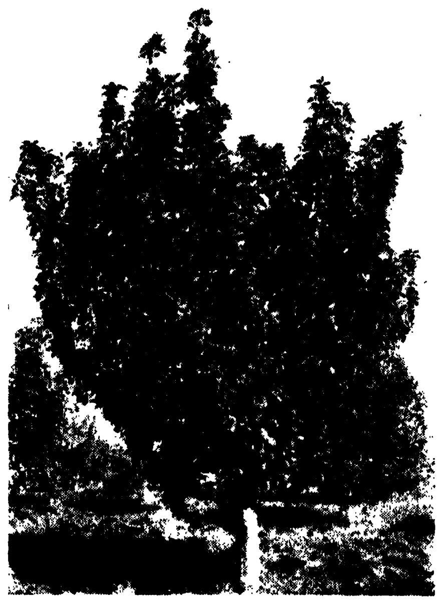
(b) The general appearance of the fruit, as to colour, bloom, etc., at the time of harvesting was good, comparing most favourably with fruit from the unsprayed check trees.

(c) Fruit from D.D.T.-sprayed trees showed no more sunscald than the fruit from unsprayed check trees.

No loss of fruit due to sunscald, resulted with any of the treatment, despite the fact that several heat waves occurred during the test period.

Effect of D.D.T. on the Incidence of Other Pome-fruit Pests.

(a) Red spider (*Eotetranychus telarius*) assumed plague proportions on the D.D.T.-sprayed trees. As early as 23rd November



Normal Foliage of Tree when Free from Red Spider Infestation.

Red spider was observed on burr clover growing around the base of the D.D.T.-sprayed trees. No trace of this species of mite could be detected on clover and other plants growing beneath trees which received lead arsenate or the unsprayed check trees.

This mite invaded the D.D.T.-sprayed trees during December, and by the end of January all were found to be infested to a noticeable degree and damage, especially to the new growth, was observed. The mite

population continued to build up during February, and by early March all trees were heavily infested. It was not until the end of March that mite activity commenced to dwindle.

The leaves became bronzed and harsh in appearance and commenced to fall during late March-early April. Approximately half the leaves had been shed from these trees by the end of April. The trees which received only two sprays of D.D.T. during the season (Treatment C) also became infested with this species of mite; however, the infestation was not as heavy as it was on the trees which received six sprays of D.D.T., but it was sufficient to cause damage which could be detected some distance away.

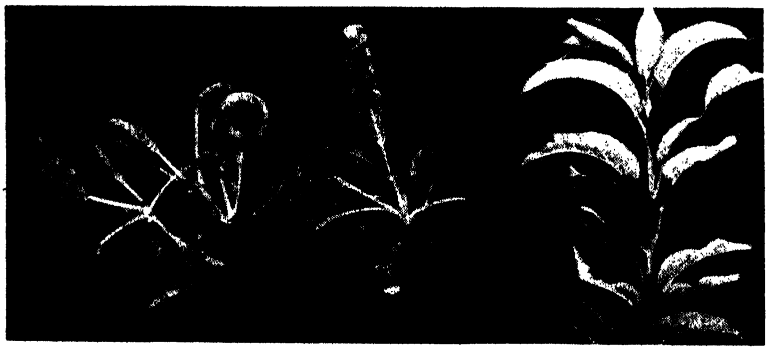
The trees that were sprayed with the lead arsenate-white oil combination and the unsprayed check trees remained free of this mite right throughout the season.

(*b*) The woolly aphid (*Eriosoma lanigerum*), was observed on the majority of trees included in the experiment at the beginning of the season. However, the parasite *Aphelinus mali*, which had been most active during the winter, exerted marked control. The aphid population was at such a low level that spraying for control was not deemed necessary.

On the trees sprayed with D.D.T.-solvent naphtha emulsion throughout the season, a noticeable build up of the woolly aphid population was recorded during early December. Despite thorough coverage with the D.D.T. spray, when applying the various cover sprays, this aphid persisted and continued to build up right through until April. A close examination of these aphid colonies during April failed to reveal the presence of the parasite.

No increase in aphid population was observed on either the unsprayed check trees or the trees sprayed with the lead arsenate-white oil combination. On the trees that received two D.D.T. sprays (Treatment C) during the season a light increase in the woolly aphid population was observed during March.

(*c*) The harvested fruit from all treatments was closely scrutinised for the presence of San José scale (*Quadraspidiotus perniciosus*) when fruit was being examined for moth damage. No trace of scale was recorded on any of the fruit from the various treatments. However, as all the trees included in this experiment received a dormant oil spray late in the winter of 1945 for the control of this scale, it was not possible to determine in this one season whether the use of D.D.T. makes any difference to the occurrence of this scale.



Left and Centre.—Leaves showing Injury due to Red Spider Infestation following D.D.T. Sprays.
Right.—Normal Uninfested Foliage.

Codling Moth Control.

While D.D.T.-solvent naphtha emulsion gave the best results, it was, however, closely followed by the lead arsenate-white oil and D.D.T.-solvent naphtha emulsion spray programme and the straight lead arsenate-white oil combination. All the treatments gave good control when compared with the unsprayed check trees which yielded 54.5 per cent. infested fruit.

Conclusions.

(1) D.D.T. can be classed as a most efficient insecticide for the control of codling moth. However, the results obtained do

not show that it is very much superior to the standard recommendation of lead arsenate and white oil.

(2) The use of D.D.T. on pome fruit trees increases rather than checks the infestations of red spider and woolly aphid.

Red spider, which reached plague proportions on trees sprayed with D.D.T. throughout the season caused marked damage to foliage, which resulted in an early leaf-drop.

In the case of woolly aphid, no noticeable damage occurred, but the build up in the population was most noticeable. While D.D.T. cannot be classed as an efficient control for this aphid, it appears to cause a high mortality of the aphid parasite.

When the effect of D.D.T. spray on red spider and woolly aphid is taken into consideration it will be realised that much more field work must be carried out to determine the efficiency of this product for the control of codling moth in the Murrumbidgee Irrigation Area. Possibly the addition of a miticidal or an aphicidal spray to D.D.T. may assist in reducing the red spider and woolly aphid populations to a minimum. The addition of such sprays to the D.D.T. will increase the already high spray costs.

Using a 0·1 per cent. D.D.T. spray, the cost for every 100 gallons at present is at least 20s. to 25s. whereas the lead arsenate-white oil combination costs 8s. per 100 gallons when the oil is used at the rate of 1 per cent. and 4s. per 100 gallons when white oil, or other chemicals, are used as wetters, spreaders or stickers.

Another 1,000 lb. Cow.

A JERSEY cow, "Booroola Silver Lady," aged 9 years and 7 months, owned by Mrs. H. S. Lattimore and Son, Taree Estate, Taree, has recently completed a 365 days record in which she has yielded over 1,000 lb. of commercial butter.

The figures were 16,597½ lb. of milk, 5 per cent. average test, and 824.86 lb. butterfat, equal to 1,005.9 lb. commercial butter on a conversion ratio of 100 lb. of commercial butter to 82 lb. butterfat.

Production for the eleven sub-periods of 30 days each and one of 35 days were as follows:—

Month.	Milk. lb.	Butterfat. lb.
May, 1945	1,650	69.3
June	1,755	76.59
July	1,740	82.11
August	1,695	69.57
September	1,710	86.85
October	1,545	71.37
November	1,230	66.06
December	1,230	66.96
January, 1946	1,080	62.70
February	1,020	56.1
March	945	61.77
April	997.5	55.48
Total	16,597.5	824.86

Varieties of Approved Seed Available.

IN order that farmers may be directed to what are regarded by the Department as the most satisfactory local sources of approved seed of recommended commercial varieties of farm crops and vegetables, the Department is willing to supply information concerning such sources of seed of the following varieties:—

Tomatoes—
Rouge de Marmande, Pearson, Break O'-Day.

Export of Peaches and Cherries to New Zealand.

THE results of his talks with the Dominion Government had been most satisfactory, said the Minister for Agriculture, Mr. Graham, in reference to his recent visit to New Zealand in connection with the development of reciprocal trade between that country and Australia.

One immediate result that would be of interest to local producers was that it would now be possible for large quantities of New South Wales peaches and cherries to be exported to New Zealand.

With the rapid expansion in production of peaches of good carrying qualities, this additional outlet would be of special value to growers of this fruit. The export of cherries to New Zealand had been of considerable benefit to that industry for some years prior to the war, but for various reasons these exports had ceased, so that with the New Zealand market again opened, the expansion of the industry would be considerably stimulated.

THE MILK SUPPLY IN WESTERN DISTRICTS.

Problem of Periodic Shortage.

VALUE OF THE SAANEN MILCH GOAT.

CONTRIBUTED BY THE DIRECTOR GENERAL OF PUBLIC HEALTH.

THE shortage of milk for human consumption is one of the most serious effects of drought in the western areas of this State. In many of the small and more remote towns the local milk supply comes from a few cows owned by individuals, and often must, of necessity, be supplemented by processed milk.

The value of milk as an item of food is such that every effort should be made to avoid these recurring periods of shortage, and to this end much greater use should be made of suitable goats in these areas—where the supply of fodder and the cost of feeding present such a problem.

Dried milk is simply whole cream milk, with the water content (which constitutes about 85 per cent. of the milk) dried out, leaving all the remaining constituents of the milk in a powder form which is easily reconstituted. Although dried milk is a valuable food it is comparatively expensive and is not as palatable as fresh milk.

Goat's milk has a high nutritive value, and a well-bred Saanen doe will give about 3 quarts of milk daily—provided it is properly and adequately fed. For the feeding of infants, goats' milk is particularly satisfactory; its composition is very similar to that of cows' milk, but it is more easily digested. Butter made from goats' milk, when artificially coloured, is indistinguishable from butter made from cows' milk, and cheese from goats' milk is of the highest quality. The goat is practically free from tuberculosis* which may be readily communicated to humans through cows' milk.

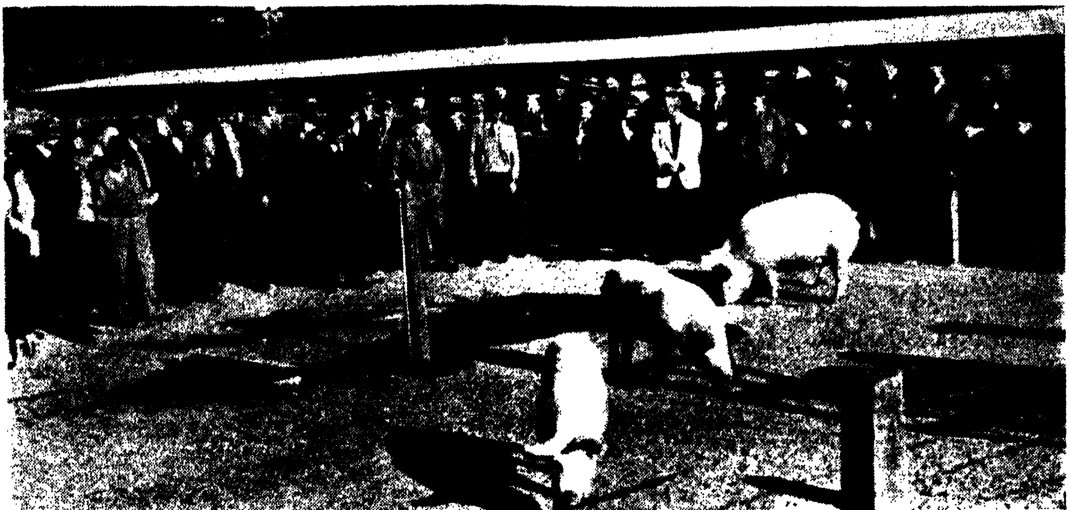
For a maintenance outlay of a few shillings weekly a supply of up to 5 gallons of milk per week may be obtained. This is a proposition which merits the consideration of parents of young children in western areas, particularly where the family income is limited and circumstances, such as the availability of land, etc., permit of a goat being kept.

Unfortunately, too many people have an unwarranted contempt for the goat, mainly as the result of ignorance of its true value. Well bred animals produce good quality milk in quantities that compare most favourably with the cow when size, price and cost of feeding are considered.

Nutritionally adequate quantities of milk for human requirements are at least: 1½ pints daily for children up to five years of age; 1 pint daily for children up to nine years of age; 1½ pints daily for nursing and expectant mothers; and for the average adult ¾ pint to 1 pint daily. A good milch goat is a valuable asset in enabling the maintenance of a high standard of nutrition of children, particularly where supplies of milk from other sources are unsatisfactory.

A Well-bred Saanen Doe.

* This danger from cows' milk does not exist when the cows have been subjected to the tuberculin test, or when the milk has been properly pasteurised.



THE PIG RAISERS' SCHOOL,
held at Hawkesbury Agricultural College in July.

Above.—The Minister for Agriculture visits the School.

Above.—**Mr. A. F. Grey, Chief Piggery Instructor, Conducting a Class.**

Above.—**Students from All Sections of the State.**

L. to R.—Messrs E. M. Beck (Wagga), J. M. England (Dubbo), P. G. Heatley (Yenda) N. J. Myers (Inverell) W. T. Tiee (Murwillumbah), and E. H. Wood (Bega).

At Left.—**A Lecture in the Sun.**

The Modern Trend in—

PIGGERY LAY-OUT ON DAIRY FARMS.

G. M. D. CARSE, H.D.D., Live Stock Officer (Pigs).

SUCCESS in pig-raising is to a large extent determined by effective planning of the section of the farm devoted to the pig-herd. Such planning includes the choice of site, type of accommodation, convenience of lay-out, availability of an abundant water supply and observance of any legal requirements. It is with regard to the second point, i.e., type of accommodation, that in recent years a marked change of thought amongst farmers has been noted by competent observers throughout the world. The change reveals a distinct leaning towards providing a larger share of the farm, in terms of acreage, for pigs and a swing to what is called the paddock or grazing system of pig-raising. It is interesting to note further that the change is linked with the wider swing of agricultural thought in this country towards mixed farming.

At one time it was the practice to confine pigs in small, bare pens—and often in sheds without pens. As a result piggeries have come to be universally associated with a low standard of hygiene and unpleasant working conditions, coupled with a fatalistic resignation to a loss of anything up to 25 per cent. of young pigs between birth and marketing.

Allocation of Area.

From a straight-out cash-return aspect the pig is entitled to a greater share of the farm area than it has been given in the past. For example, in New Zealand, it is stated that the revenue per brood sow averages £27 per annum. It can be accepted that the relative figure for New South Wales is, at least, £20. When it is remembered that it takes a good dairy cow to give a similar return and that good grazing land is stocked on the basis of a cow to 2 acres, it follows that, at least, a similar area could well be allocated for each brood sow and her progeny. In effect this means that on the average dairy farm, where four brood sows are kept, the pig section should cover an area of 8 acres.

Such a proposition may still come as a shock to many farmers, accustomed to thinking of the piggery being confined to an acre or two at the most, but there is much to commend the idea, and moreover it has proved itself in practice. It will ensure that all pig paddocks will remain well-covered with a good sward of grass or green crop and will lead to the virtual disappearance of the manure-littered, bare, soil-eroded pig yards so commonly seen in our dairying districts.

Layout of a New Zealand Piggery.

Note.—The circular corrugated-iron structures are creep feeders.

A Good Lay-out.

The ideal method of laying out such an area would be to divide it up into ½ acre paddocks with a light movable shed, measuring not more than 8 feet by 9 feet in floor space, provided for every two paddocks. Movable troughs on hinged feeding platforms mounted on skids could also be provided so that all equipment could be moved about within each paddock and from paddock to paddock. Provided the lie of the land is suitable, and for convenience of handling and feeding, the paddocks should be laid out in two blocks of eight paddocks each, with a 10 feet-wide laneway between each block.

By skilful use of movable equipment the foregoing lay-out will permit the employment of a planned system of rotational grazing and cropping, to include the growing of good quality grasses, protein-rich crops (such as lucerne, field peas, cow peas and rape), green cereal crops (barley, wheat and oats), and root crops—according to district, climatic conditions and season of the year.

Advantages of the System.

It is interesting to consider the advantages which accrue from this type of pig-farming. Above all other considerations hygiene, or to put it in a more homely way, cleanliness in eating, sleeping and living conditions, will be maintained at a satisfactory level, making it possible to keep the standard of health high enough to provide the maximum power of resistance to the effects of bacterial infection and sudden changes in the weather. Similarly, by avoiding a concentration of pigs on a small area day after day without respite a big step is made towards prevention of worm infestation. The importance of this point has perhaps not been fully realised in the past. For instance, the use of troughs on wooden platforms mounted on skids makes it possible to avoid the concentrated pig traffic on a relatively small area of ground, year after year, which is inevitable around a fixed feeding trough, even though the latter be fitted with a concrete feeding platform.

Provision of good grazing will ensure an adequate supply of vitamins and much of the mineral requirements. The nutritive value of good quality grass and cultivated fodder crops can also play a part in supplementing the concentrate portion of the ration. The exercise gained whilst grazing must also be taken into account in relation not only to good health, but also to carcase quality.

The building of permanent concrete structures is avoided, and as movable equipment is generally lighter in construction, building costs are kept down to a minimum. Again if, for any reason, it should become necessary to shift the piggery to another site, the minimum of expense will be incurred. In that connection even movable fences have long been a feature of pig-raising in Great Britain, and it may be that some simple form of easily-moved fencing will in time become common-place in this country.

The system also makes it possible to run pigs in small groups. Experience has shown that when not more than seven to eight pigs are running together, best results are obtained in health and development. There is less fighting and struggling at the feed trough and less crowding and more comfort in the sleeping shed—especially on cold, wet nights.

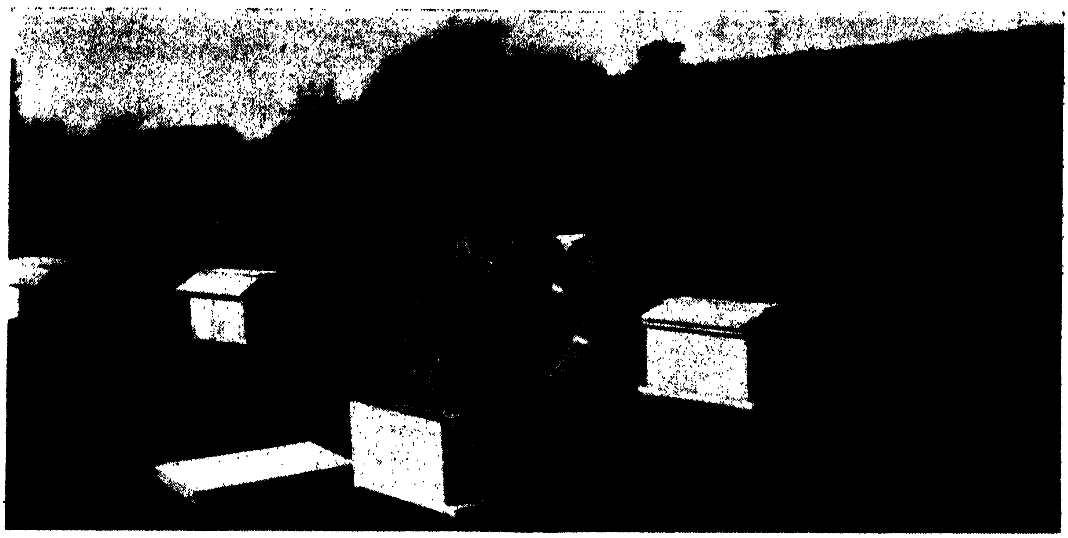
Disadvantages.

The sceptic might claim that the main disadvantage lies in the fact that the use of a greater area of land increases the labour required in feeding a bulky feed such as separated milk. However, it is amazing how ingeniously some farmers meet this problem and keep labour down to a bare minimum.

For example, much can be done by the skilful use of movable self-feeders, self-waterers and even movable "creeps." A low-swung, well-designed hand-truck on pneumatic-tyred wheels for distribution of separated milk will also soon repay its cost of construction.

Good Husbandry is Possible.

Finally, the regular ploughing-in of the manure-covered and urine-soaked surface soil in the paddocks not only keeps the soil in good cultural order, but also provides a ground surface on which the pig can live a healthly life. In other words the system represents good pig husbandry in the true sense of the term.



BEEKEEPING HINTS.

SPRING MANAGEMENT

Should be Governed by Conditions

Not by a Time Programme.

D. L. MORISON, B.V.Sc., Veterinary Officer, Apiary Branch.

A NUMBER of young beekeepers are prone to fix specific periods of the year for carrying out certain apiary operations. Some extreme cases have been noted in which such work as extracting honey from the hives, artificial increases of colonies, etc., is carried out on certain dates.

Under Australian conditions, however, any such programme of apiary management run strictly on a time basis is most undesirable and will surely end in disaster.

This unsound method of working has, no doubt, in some instances been handed down from previous generations when box hives were operated, or in others been adopted following perusal of literature published in other countries where reasonable regularity of seasonal conditions and honey flows may make it possible to carry out these operations at specified times.

However, in Australia we find extreme fluctuations in seasonal conditions. There are districts with such mild climates that, with honey flora prospects satisfactory, extracting work, and even the raising of queen bees may at times be carried out during winter. Then there are cool climates where the bees cluster very closely and little, if any, brood rearing is carried on during winter. The honey and pollen flora, too, is most variable in its behaviour—particularly the Eucalypts, some species of which flower every year, others every second or third year, while at times the general cycle of flowering periods is found to vary as a result of a change in climatic conditions.

In view of these variations in climate, management must be related to conditions and not to time or season. The young beekeeper who extracts at times when the honey the bees have stored would be better left in the hive, is sure to find himself in difficulties. Again, he will find it unprofitable, having the hives full of honey, to wait for a fixed time to extract—since heavy losses of production may result from the delay. There are other undesirable factors which result

from such delay. The hives become congested with honey and brood-rearing space in the combs will be reduced by honey being stored in the brood combs, while sets of combs will be plastered together with burr-comb; this latter trouble makes the manipulation of the hive very difficult and tends to upset the temperament of even a usually docile colony.

Inspection is the Only Sure Guide to Hive Conditions.

The majority of beekeepers have adapted their management practices to cope with the fluctuations which occur in the particular locality or localities in which their apiaries

Mr. C. Melton of Rylstone Examining Queen Cells Raised under Progressive Conditions.
[Photo by courtesy of Australian Women's Weekly.

are established. This is particularly necessary when hives are moved to a new area where a different range of flora exists, and where the climatic conditions are different. The management in the apiary will then be varied to meet the current needs of the colonies and to obtain the best in production of honey and beeswax.

The main factors which influence the experienced beekeeper in determining the timing and extent of his operations, may be arbitrarily grouped under two main headings:—

(*a*) Present indications.

(*b*) Future prospects and the work involved in preparation.

The present condition of the colony can only be determined satisfactorily by opening up the hive, even though some useful information may be gained by observation of the activity of the field force at the hive entrance. To determine the progress made in honey storage and to decide upon a time for extracting, the condition of at least a good number of control hives should be carefully noted from time to time. It is also important to obtain a good knowledge of the local honey-producing flora in order to estimate the value of the various species for honey production, and the likely duration of honey flows.

Choosing the Time for Artificial Increase.

A time must be chosen for artificial increase of colonies when inspections of the hives reveal that brood-rearing is being carried on progressively, and the hives from which brood and bees are to be drawn are populous. It is essential, too, that mature drone bees be available for mating purposes where it is desired to raise queen bees to place with the newly-made colonies.

Obviously there is no fixed date for making increase in this way, but a decision must be arrived at following regular inspections of the hives and a survey of the honey flow prospects. In some seasons increase may be made fairly early in spring; in others it may be late spring or early summer before conditions become favourable.

The extent of the increase will depend on the condition in the parent hives and the honey flow prospects for the season ahead. It is not advisable to weaken the parent hives to any great extent, or to make extensive increase when honey flow prospects for the season ahead are not encouraging. Under continued adverse times, as may occur occasionally in certain districts, it is practically impossible for the young beekeeper to make a success of the work, and his attention should be directed to making the best of the stocks on hand.

Preparations for the Honey Flow.

The beekeeper must be prepared to make the most of any honey flows which are likely to occur—as indicated by the buds showing on the honey- and pollen-producing flora within, say, a mile or two of the apiary.

The main item in the preparatory work is to ensure an adequate supply of supers to provide for honey storage for extracting operations. There is little time to spare for this work when a honey flow is on, and the heavy loss in production which occurs through lack of preparation is seldom fully recognised. In larger apiaries additional temporary assistance may be required during honey flows and arrangements for this labour should not be left until the last minute.

Strong Colonies are Essential.

In addition to being fully prepared by way of material, etc., every effort must be made to get the colonies of bees into good strength for the first flow.

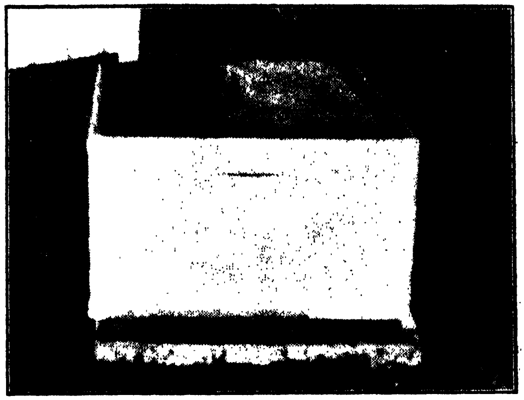
The prospects are rather good for production during the coming season, but unfortunately in many apiaries, as a result of the adverse conditions experienced during late autumn and winter, a number of colonies have become weakened in strength. These will need careful attention during spring to get them built up for any reasonably early productive field work.

The essential needs of these weakened colonies during the coming spring may be outlined as follows:—

(*a*) When the bees make a show of activity in the early season's field work, move the occupied combs over to the side of the hive which receives the morning sunshine.

(*b*) Make the small cluster as comfortable as possible, and if only one or two combs are occupied, pack them with pads of paper to assist the bees in keeping warm.

(*c*) Observe, above all, that all colonies are kept reasonably well supplied with stores.



Handy Method of Packing a Weak Colony.

If the weaker colonies can be kept in some heart for a time, it may be possible to assist them later on with brood and bees or honey from the more progressive hives without unduly disturbing the welfare of the latter.

Registration of Apiaries.

ANY person engaging in beekeeping must register with the Department of Agriculture and pay an annual fee as prescribed under the Apiaries (Amendment) Act, 1944, according to the number of hives established. Application for re-registration, together with the necessary remittance, must be lodged with the Department each year not later than 31st March.

In a reminder regarding these requirements, the Minister for Agriculture, Mr. Graham, draws attention to the fact that some beekeepers have not yet submitted the completed form of application and remittance for the current year. Such beekeepers are advised to conform with their obligations under the Act without delay.

Forms are obtainable from the Department of Agriculture, Box 36A, G.P.O., Sydney. The fees are: One to five hives of bees, 1s. 6d. per annum; six to twenty hives, 3s. per annum; over twenty hives, 6s. per annum.

Eggs Imported by Air from U.S.A.

A CONSIGNMENT of 100 White Leghorn eggs arrived by the Skymaster recently for the Department of Agriculture from the Bureau of Animal Industry, Beltsville, U.S.A. These eggs, which are from high-producing strains, were obtained with the object of utilising any birds raised from them in the progeny testing work being undertaken at the Department's Poultry Experiment Farm, Seven Hills. The eggs were placed in an incubator upon arrival and, on the first test, thirty-eight were eliminated as infertile or dead embryos. Only two eggs were cracked when received. Twenty-one chickens have now been hatched.

BACTERIAL ROT IN WASHED EGGS.

THIS article outlines the problems which confront the poultry farmer who desires to market washed eggs. It gives some indication of the investigations which have been carried out in an attempt to inhibit the development of rots in washed eggs.

The Australian egg producer caters for two markets—the local and the overseas. Eggs destined for the export trade must pass a comparatively stringent examination for quality, wherein one requirement is that the eggs shall be "clean."

Washing is a Source of Contamination.

To attain this standard producers have become accustomed to washing or wiping those eggs which show soiling or staining. With the expansion of both production and demand, various machines have been developed for the purpose of facilitating the washing of eggs and producing a clean product with a minimum of labour.

During the period covered by these developments, exporters and overseas distributors and consumers have become increasingly concerned at the progressive and continuing loss of export eggs by deterioration in quality, manifested after arrival in England. The defect responsible is due to the activities of rotting bacteria and is known variously in the trade as "bacteria," "bacterial rot," "green rot," "black rot," etc.

A considerable amount of investigation has been devoted to the problems of the origin and control of this defect, and it has now been established that one of the commonest sources of contamination is to be found in the egg washing process.

Fundamentally, the common methods of washing eggs are unhygienic. When hand washing is used, the dirt from the eggs going into the bucket soon converts the wash water into a suspension of bacteria and other objectionable matter derived from mud and from faeces; the cloth used for wiping the eggs is then saturated with this suspension. In the case of machine washing, the rollers, brushes, etc., are similarly utilising a most objectionable fluid as a cleansing agent.

A little reflection should convince one that the exposure of eggs to such a medium must result in the inoculation of the eggs with numerous bacteria. Should there be gritty material present, derived from the soil of the fowl run, this will almost certainly abrade the "mucoid covering" on the shells and so weaken whatever protection may be afforded by that barrier. To these hazards another may sometimes be added. Should eggs be washed while still warm from the nest, the sudden cooling of their exteriors causes an influx of the dirty washing fluid through the pores of the shell, bringing with it a quota of faecal bacteria; this washing of eggs while warm has been shown to have a marked influence in increasing the risk of contamination.

By way of contrast we have the established fact that dirty eggs left unwashed are not prone to bacterial rot while clean eggs subjected to washing will inevitably produce their quota of rots.

That it is the unhygienic manner in which the washing is carried out rather than the washing itself which is at the root of these disastrous results, has been demonstrated by investigators who have taken the trouble to wash eggs in a hygienic manner; such washing has been shown to have no detrimental effect on eggs so treated. Unfortunately, however, this remedy is not easy of application on a commercial scale, for it would involve an expenditure of time and labour which would seriously increase the cost of handling.

Chemicals of Little Value.

In view of the fact that bacteria are readily destroyed by chemical disinfectants it would seem reasonable to hope that disinfectants, used in association with the normal washing process, would eliminate the rotting bacteria and thus prevent the development of high proportions of rots in washed eggs.

This avenue has been thoroughly explored by numerous investigators both here and abroad; in this country the Council for Scientific and Industrial Research, Departments of Agriculture and egg marketing authorities have all played a part in the many experiments undertaken. Caustic soda and chlorine disinfectants were thoroughly investigated, and a considerable range of other chemical agents was also examined

The results were disappointing. The hopes of effective chemical control of bacterial rot were not fulfilled, and, at the present time, it seems that the use of chemicals offers no reasonable prospect of making egg washing safe. Egg producers are, therefore advised that even though they include chemical disinfectants in the egg wash water, they cannot hope to avoid the loss of a considerable percentage of eggs which they wash.

Alternative Methods.

Alternative methods of reconciling the attainment of export quality in eggs with the producer's very real difficulties on the farm are available, though some at least of these methods are as yet only in the developmental stage. There are two main avenues through which betterment may be expected. Firstly, improved methods of husbandry would reduce the number of eggs needing washing. Information on this point is available to producers in the leaflet, "Maintenance of Quality in Eggs," which is available on application to the Department of Agriculture.

Promise in Pasteurisation.

Secondly, there is promise in the method of pasteurising eggs in hot water recently introduced by Professor Funk, of Missouri, U.S.A. It is hoped that this method will be perfected, as it will combine adequate cleaning of the shell with practical freedom from the risk of rotting.

There are a number of problems to be surmounted before satisfactory answers can be given to all the demands which the egg producer and consumer may put forward. Foremost among these problems is that of the degree of heat to be selected for pasteurising the eggs; it would be very easy to kill all the bacteria on the shells by using very hot water for a very long time, but this would result in coagulation of the albumen and would be objectionable to consumers. On the other hand, a lower temperature might be found which would be sufficient to kill the bacteria without hardening the egg white, but which would leave unaffected those other factors in the egg which cause such defects as thinning of the albumen and off-flavour in the yolk during storage.

The ideal process is one in which all of the desirable results—the chief of which is a clean egg, free from rotting bacteria—are achieved without any adverse effects on the quality or appearance of the egg. This ideal has not yet been realised, but investigations designed to ascertain the best conditions for applying this form of treatment, are still being conducted.

Building Up Small Merino Flocks.

THE small flock owner who is breeding for wool should have an ideal in his mind. He must have in view the sheep that will grow the type of wool most payable and best suited to the district, and he will find it worth while to acquaint himself with the views of those who have had longer experience as to the most satisfactory type of wool to grow under local conditions. Having his ideal before him, he should keep it steadily in mind. striving each year when classing—and an annual classing should be the practice with even the smallest flock—to bring the flock nearer the ideal by culling out all ewes that vary greatly in any of the essential qualities.

The important qualities to consider are a well-shaped frame, considering the type and breed, good legs (not crooked), and wool of the desired quality (fineness) and length, and as even and dense as possible all over the body. It is not necessary to have quite such a shapely carcase in the case of the Merino as with the mutton breeds.

The most common faults are small, undersized, or weedy frame; a dip behind the shoulders called "devil's grip" (a sign of weak constitution); narrow shoulders or hips; and crooked legs or feet. Common faults in the wool growth which should also be avoided are unevenness over the body, presence of hair or kempy fibres, lack of density or length, and dullness or dinginess in colour due to too much condition or to an undesirable type of yolk. There are other wool characteristics and faults which should be considered, but those mentioned are the most important.

The best time to class the flock is just prior to shearing, as the sheep are then carrying full evidence of their value as producers of wool, but it is quite possible to carry out the job any time after the sheep are carrying seven or eight months' growth.—E. A. ELLIOTT, Sheep and Wool Expert.

COST OF REARING PULLETS.

THERE is much misconception, even among experienced poultry farmers, regarding the cost of rearing young stock—an the tendency is to over-estimate costs considerably, especially the cost of feeding.

As far as feeding is concerned it will be found that to raise a chicken to twenty-four weeks of age the cost works out at about 25 per cent. of that required to feed an adult bird for a year. For example, for the year ended 30th June the average cost of feeding hens was about 9s. per bird and the cost of raising chickens up to twenty-four weeks of age was 2s. 2¼d. per bird.

The detailed statement given below of the cost of feeding chickens over four-week periods up to twenty-four weeks has been compiled from quantities of food consumed in experiments carried out at the Poultry Experiment Farm, Seven Hills, and on the basis of £10 10s. per ton for the mash portion and 6s. 3d. per 60 lb. for the grain used—which should cover average costs at the present time.

Age.	*Feed Consumen*	*Cost per Bird.*
1st 4 weeks	0–16 oz.	1½d.
2nd 4 weeks	2 lb. 8 oz.	3½d.
3rd 4 weeks	4 lb. 0 oz.	5d.
4th 4 weeks	4 lb. 2 oz.	5¼d.
5th 4 weeks	4 lb. 8 oz.	5½d.
6th 4 weeks	4 lb. 8 oz.	5½d.
24 weeks	20 lb. 10 oz.	2s. 2¼d

In addition to cost of feeding there are, of course, other costs, exclusive of labour and overhead charges, which are variable and difficult to estimate. These are the initial cost of the chickens and the brooding expenses. Again there is a difference between the cost of chickens hatched on the farm and those purchased as day-olds, and there is also a variation in brooding costs. However, allowing for a six weeks' period in the brooders, 3d. per chicken should cover the cost of most of the systems in use, while £6 per 100 might be set down for the purchase of pullets. A further allowance must also be made for mortality in rearing, which again is a very variable factor; however, an allowance of 20 per cent. loss by death from day-old to twenty-four weeks should prove ample and not be exceeded on any commercial farm.

On the basis outlined the total costs would work out as under:—

Purchase of chickens @ £6 per 100 allowing for 20 per cent. losses	1s. 6d. each.
Brooding costs	3d. each.
Cost of feeding to 24 weeks ...	2s. 2¼d. each.
Total ...	3s. 11¼d. each.

Raising Cockerels Not Justified.

Although cockerels would cost somewhat less to raise because of the cheaper rate at which cockerel chickens can be purchased,

MORE AND BETTER QUALITY EGGS REQUIRED
For The Export Trade.*

TO HELP FEED THE BRITISH PEOPLE, and MAINTAIN THE AUSTRALIAN POULTRY INDUSTRY.

IT IS VITAL this year that—

(1) Every suitable egg should be packed for export; and

(2) Every egg so packed should reach the British consumer in first class condition.

Experiments have shown that the loss in quality between packing in Australia and delivery in England is caused mainly by the form of cleaning widely used on poultry farms in Australia. This cannot be abolished overnight but **much of the trouble in the export pack can be avoided if no egg is cleaned unnecessarily.**

Every effort should therefore be made to reduce the number of eggs which really require cleaning—by attention to the nesting and litter and by frequent collection of the eggs

The naturally clean eggs should be kept separate from the really soiled ones from the time of collection from the nests and should be packed and forwarded to the grading floor in separate cases from those eggs which it has been necessary to clean. The cases containing these untreated eggs should be labelled "Unwashed."

Cases containing cleaned eggs should be labelled "Local." Heavily soiled eggs which have been cleaned on the farms are suitable for local use.

IT IS IMPORTANT THAT SLIGHTLY SOILED EGGS WHICH MAY BE EXPORTED WITHOUT CLEANING, MUST NOT BE CLEANED. The success of the export season will depend upon the full co-operation of poultry farmers in complying with this request. In this way they will protect their market.

The grading standards for shell cleanliness have been varied to permit of passing as clean for export, eggs which are slightly speckled or soiled. **Remember this and do not clean every egg the shell of which is not spotless!**

The fact that Australia's export pack may not present its previous immaculate appearance need cause no concern. The British trade and the British consumer demand high internal quality rather than external appearance. For years they have gladly accepted unwashed eggs from exporting countries.

In the interests of the future of the poultry industry and to help in preventing unnecessary suffering due to the food shortage in Great Britain, every producer should co-operate loyally in carrying out these plans.

The producers part is very simply summarised as follows:—

(1) Clean only the heavily soiled eggs.

(2) Pack washed and unwashed eggs in separate cases.

(3) Label with the word "Local," cases containing all cleaned eggs and eggs obviously too small for the export pack.

(4) Label clearly with the word "Unwashed," cases containing eggs which have not been cleaned or washed.

* Adapted from a Statement issued with the joint approval of the Department of Commerce and Agriculture Technical Sub-committee on Poultry Production, appointed by the Australian Agricultural Council, the State Egg Marketing Boards, the Egg Producers' Council, and the Controller of Egg Supplies.

and would show a fairly good profit at present market rates, the feed position is such that no attempt should be made to produce market birds this season.

Even though little wheat might be used in rearing cockerels it would be necessary to substitute mill offals, of which supplies are barely adequate for feeding adult hens and pullet chickens, and there is no justification for those who may be in a position to raise cockerels using the feed supplies so badly needed by those depending upon egg-production for a living. Moreover, in view of the representations made by the A.P.F.A. to the Minister for Commerce for an increased quota of wheat for rearing chickens, it would be a breach of faith to raise cockerels.

THE EXPORT SEASON.

THE recent decision of the Department of Commerce and Agriculture to relax somewhat the standard of cleanliness for eggs exported, is welcome news to the industry, more especially as actual examples of slightly soiled eggs which will be allowed in the export packs have been prepared and can be seen by producers at the Egg Marketing Board.

For many years attempts have been made to induce the Commerce Department to amend the regulations to permit of eggs being included in export packs which, while slightly soiled, would not be objected to by the most fastidious, but without avail—and thus many thousands of eggs have been rejected each year which could have been exported without detriment to the general appearance of the packs.

What is worse, however, is that in many cases, producers adopted the practice of running all the eggs over washing machines instead of first removing the few which would pass for export under the stringent regulations, and this has been responsible for many of the quality defects reported in overseas packs.

With the greatly expanded production of eggs in country districts during the past few years and the cessation of the demand for eggs for the Services, it has become necessary to export a much greater percentage from the districts near exporting centres than hitherto, as most of the country-produced eggs are not suitable for export on account of the distance over which they have to be transported.

Thus to obtain the 12 million dozens, which is the quota allotted to this State out of the 30 million dozens in shell which Britain is prepared to accept this year and next, it is essential that every egg which comes up to the desired standard be packed, and as these have to be packed between July and December, it will be realised that every effort will be necessary to obtain this quantity.

Failure to export this quota will seriously embarrass the local market and affect prices. The attention of poultry farmers is directed to the statement on page 442 concerning the procedure for handling eggs during the export season, and producers are urged to co-operate to the greatest possible extent.

Maize Varieties Recommendations.

(*Continued from page* 413.)

(*d*) *Moruya River.*

*Fitzroy, Hickory King, Golden Nugget.

(*e*) *Bega and Pambula Rivers.*

Fitzroy, Hickory King, Bega Yellow, Giant White, Golden Nugget.

NORTHERN TABLELAND.

Wellingrove, Iowa Silvermine.

CENTRAL TABLELAND.

Funk's Yellow Dent, Iowa Silvermine.

SOUTHERN TABLELAND.

Moss Vale District.

Hickory King, Fitzroy.

WESTERN AND SOUTHERN SLOPES.

Funk's Yellow Dent, Murrumbidgee White.

THE NEW TYPE BUFFALO FLY TRAP

Uses D.D.T. on Glass Panels.

Demonstration Trap at Murwillumbah.

DETAILS of a new type of trap for the control of buffalo fly are contained in an information circular issued by the Division of Economic Entomology of the Council for Scientific and Industrial Research. This trap is made of more durable materials than the gauze-sided horn fly trap, is simpler in design, and it is used in conjunction with the new insecticide, D.D.T.

The accompanying drawings refer to a trap of this type as tested by C.S.I.R. No doubt most farmers who desire to construct a trap will use materials they have on hand. Whatever materials are employed, the general features of the design should be followed. Exact copying, if desired, should be possible from the drawings and descriptive tables of the timber required—which may be obtained from C.S.I.R., 314 Albert-street, East Melbourne.

The New South Wales Department of Agriculture has made arrangements for the erection of a trap of this new type in the Stock Office yard at Murwillumbah in order that farmers may have an opportunity of observing the trap in operation. This is in addition to the gauze-sided traps already erected on Grafton and Wollongbar Experiment Farms and also on the property of Mr. A. C. Pratt at Murwillumbah.

It is claimed that the new trap is quite as effective as the horn fly trap and its regular use by a herd keeps the fly down to negligible numbers.

The operation of the new trap is dependent on the fact that flies which crawl for only a brief period on a surface treated with D.D.T. eventually die. D.D.T. is not a repellent, but a buffalo fly has merely to alight for a few seconds on a treated surface to pick up sufficient D.D.T. to cause its death. The flies do not die suddenly, but within a very short time of coming in contact with D.D.T. are incapable of normal behaviour. They are soon unable to fly or walk, and usually die in less than an hour.

Principle of the New Trap.

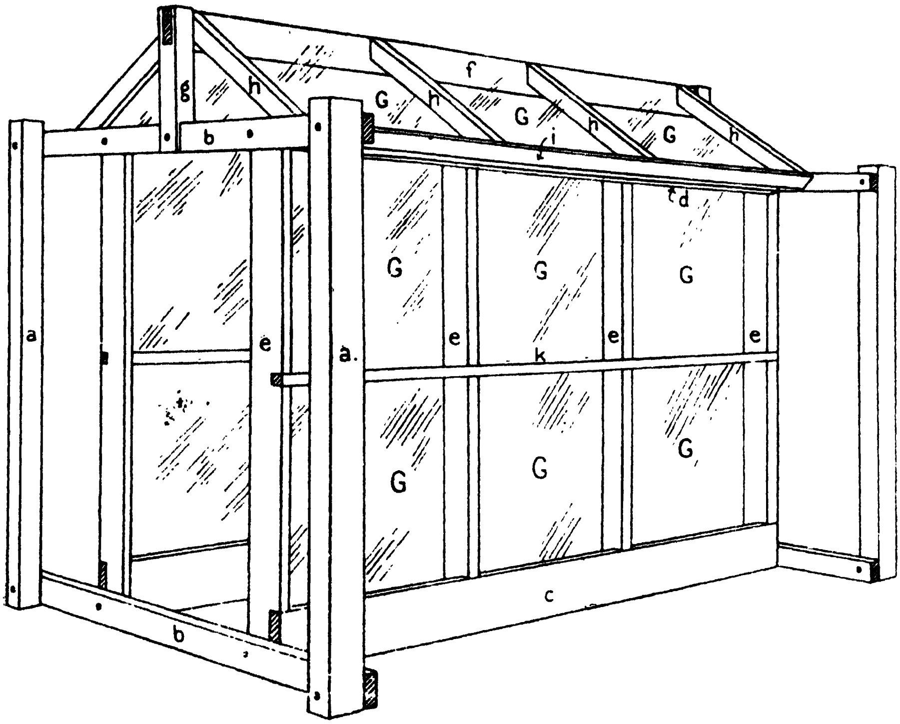
In the horn fly trap, the flies are dislodged by canvas screens which scrape the body of the beast as it passes through the passageway. The disturbed flies are collected in gauze trapping boxes lining the sides of the passageway. As they must have frequent access to cattle to survive, and cannot escape from the boxes, they die there in less than a day.

The general framework of the new trap is similar to that of the horn fly trap, but the opaque flat roof is replaced by a gabled roof of glass, and the gauze trapping boxes are replaced by sheets of glass. D.D.T. solution is applied to the inside of the glass of the roof and sides, so that a deposit of the insecticide is left after the evaporation of the solvent. The flies are dislodged from the cattle by a screen of canvas curtains exactly as in the horn fly trap. They are not held permanently, as in the horn fly trap, but merely buzz around on the glass for a while in contact with the D.D.T. when trying to follow the cattle past the curtains. In so doing, the flies pick up enough D.D.T. to kill them. Some of the flies escape from the open end of the trap, but almost all that do so are already so affected by D.D.T. that they are unable to find their way back to the cattle, and die in the vicinity of the trap.

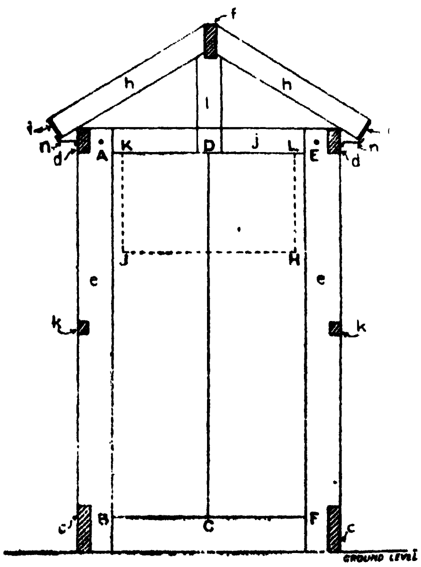
Use of the Trap.

Like the horn fly trap, the new trap is best suited for the protection of dairy cattle, which can use the trap twice daily if it is built into the fence of the milking yards. A trap must be used daily by most of the cattle in a herd to secure a worthwhile degree of control. Its use for the protection of beef cattle is generally impractical, as they cannot be made to visit one spot frequently enough.

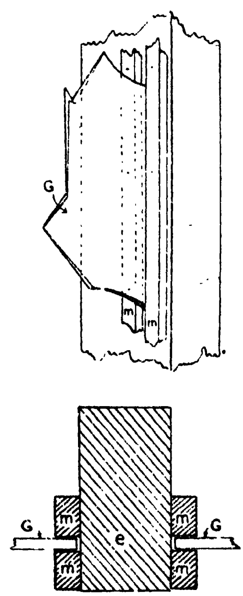
The trap should be built into the fence of the milking yards so that the herd uses it on the way into the shed. In some cases,



Perspective sketch of frame of trap..



Cross section of trap



Simple method of holding glass

it can be placed so that the herd can be diverted back through it after milking. If this can be done without undue trouble, more effective control is obtained, but, generally speaking, twice-daily trapping results in adequate control of the buffalo fly.

The cattle should be allowed to become accustomed to the trap by letting them pass through it for several days without the canvas hangings. Then they must be trained to force their way through the screen of canvas by adding the curtains one at a time at intervals of a few days.

The Pig Industry in New Zealand.

IN some brief impressions of farming in New Zealand, the Minister for Agriculture, Mr. Graham, recently returned from talks with the New Zealand Government in connection with the development of reciprocal trade in primary produce, comments as follows on pig farming in the Dominion:

"I noticed in the pig industry in New Zealand that they are facing the same difficulty that is confronting us in Australia. That is, a general tendency towards a lack of length of carcase in many of the pigs they are producing. New Zealand pig producers, however, are aware of this weakness in their stock, and through their Pig Clubs and the Department of Agriculture are endeavouring to eliminate it by their system of litter recording and bacon carcase competitions. They are working along the right lines in an endeavour to produce the ideal carcase, but, like ourselves, are still quite a long way from attaining perfection.

"In New Zealand a levy of 3d. is imposed on all pigs slaughtered, from which a considerable income is derived each year. This is used to finance the National Pig Council, which operates through District Councils comprising a number of Pig Clubs. It is undoubtedly a very satisfactory set-up for the conditions operating in New Zealand, and is producing good results."

Dehorning of Calves by Cauterisation.

THE prevention of growth of horns in calves by cauterisation of the horn-bud should be carried out when the calf is very young—the earlier the better. The earliest age will depend upon breed characteristics, and, to some extent, the development of the calf. Usually, the best period is when the calf is one to five days old, and preferably the calf should be less than ten days old.

The procedure is as follows:—

Snip the hair from off the horn-bud or button in a circular patch about half an inch in diameter, and smear the area surrounding this patch liberally with some grease, such as vaseline, care being taken that no grease gets on the actual horn-bud. A stick of caustic potash (caustic soda may be used) should then be taken, moistened, and rubbed with firm pressure on to the horn-bud. The stick should be wrapped in paper or placed in some holder, and it *should not be moistened on the tongue.*

The rubbing should be continued for perhaps a minute, but this will depend on the firmness of the pressure exerted. After momentary rubbing the skin is seen to disintegrate, and gradually a raw, moist area is produced. After doing several calves the farmer will have a good idea of how far one must proceed to destroy the future formation of the horn. Incomplete destruction of the hour may result in twisted, dwarfed or "snaily" horns.

The calf should be kept under close observation, and should any tendency for the horn-bud to reform be noticed a further rubbing with the caustic stick will complete the behorning.

Need for Care in Selection of Eggs for Setting.

THE necessity for careful selection of eggs for incubation cannot be too strongly emphasised, points out Mr. E. Hadlington, Poultry Expert. All eggs used should be at least 2 ounces in weight, and although early in the season there is a temptation to put in eggs which do not come up to the desired standard, it is better to let the incubators go slack than to put in unsuitable eggs. The guiding factor in selecting eggs should be to use only those which are as near to normal as possible in shape, texture of shell, etc. All those with thin, uneven, and porous shells should be passed out, also those which are under 2 ounces in weight, as well as the unduly large ones.

Particular care should be taken with regard to the rejection of small eggs, because strong stock which will in turn lay large eggs cannot be expected from under-sized eggs, which are an indication of weakness. The aim must be to build up the flock and maintain stamina to withstand the strain of high production, and the selection of the right class of eggs for incubation is one step in that direction.

The freshness of the eggs is a factor which will affect hatching results, and in this connection the older the eggs are (over one week) the less the chances of a good hatch, especially when set in an incubator. If set under a hen, eggs may be two or three weeks old and still hatch well. If eggs have to be kept over a week, it is a good plan to place them in a box and cover them with bran. They should be turned daily and this can be done by turning the box, but when setting in an incubator it is not advisable to keep the eggs for more than a week.

TRAIN SERVICE REDUCTIONS

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Owing to its inability to obtain adequate quantities of coal the Department of Railways has been forced to reduce its train services for the second time in less than seven months.

It is most disappointing that such action has been necessary. Last March new train time-tables were introduced to give standards of service that war conditions had previously made impossible. It was confidently anticipated that those timetables would be maintained. But for some months, due to influences over which the Department has no control, sufficient supplies of coal have not been received to provide the services desired.

Every endeavour has been made to make the best of an unfortunate set of circumstances. Passenger and goods train services have been re-arranged to effect the required savings of coal and, at the same time, to cause as little inconvenience as possible. Nevertheless some inconvenience, and possibly a certain amount of hardship, is unavoidable when train services are reduced.

While regretting the present disabilities the Department earnestly requests your co-operation until normal conditions return. Railwaymen will be helped if you keep in mind that they are trying to help you.

S. R. NICHOLAS,
Secretary for Railways.

Tubercle-free Herds.

THE following herds have been declared free of tuberculosis in accordance with the requirements of the scheme of certifying herds tubercle-free, and, unless otherwise declared, this certification remains in force until the date shown in respect of each herd :—

Owner and Address.	Number Tested.	Expiry Date.
Registered Stud Herds.		
Bathurst Experiment Farm (Guernseys) ...	28	12/10/46.
Berry Training Farm, Berry (A.I.S.)... ...	129	16/10/46.
H. F. Bradley, "Nardoo," Ashford Road, Inverell (Jerseys)	40	13/4/47.
L. W. Campbell, "Dunmallard," Fern Hill Road, Inverell (Jerseys)	39	21/7/47.
E. J. Cattell, "Kapunda," Rob Roy, Inverell (Jerseys)	121	30/6/47.
E. Chegwidden, "Austral Park," Berry (Jerseys)	88	14/1/47.
Christian Bros., Novitiate, Mt. St. Joseph, Minto	25	11/9/46.
B. N. Coote, Auburn Vale Road, Inverell (Jerseys)	85	23/7/47.
Cowra Experiment Farm (Ayrshires)... ...	53	9/7/46.
Department of Education, Yanco Agricultural High School (Jerseys) ...	64	1/3/47.
R. C. Dixon, Elwatan, Castle Hill (Jerseys)	29	5/3/47.
C. P. Fairbairn, Woomargama	173	17/3/48.
Farm Home for Boys, Mittagong (A.I.S.) ...	31	24/7/46.
Farrer Memorial Agricultural High School, Nemingah (A.I S.)	44	28/8/47.
N. L. Forster, Abington, Armidale (Aberdeen-Angus)	167	24/5/48.
A. D. Frater, King's Plain Road, Inverell (Guernseys)	107	11/4/47.
W. G. A. & F. J. Frendenstein, "Chippendale," Grenfell Road, Young (Beef Shorthorns)	47	15/1/47.
Grafton Experiment Farm (A.I.S. and Aberdeen-Angus)	249	30/7/46.
Hawkesbury Agricultural College, Richmond (Jerseys)	119	19/3/47.
Hurlstone Agricultural High School, Glenfield (Ayrshires)	52	21/7/46.
Kahlua Pastoral Co., "Kahlua," Coolac (Aberdeen-Angus)	257	30/11/47.
E. L. Killen, "Pine Park," Mumbil (Beef Shorthorns)	261	25/9/46.
G. Knight, Tannabah, Coonabarrabran ...	60	30/11/46.
Lidcombe State Hospital and Home (Friesian)	111	3/10/46.
Limond Bros., Morisset (Ayrshires)	64	26/4/47.
McGarvie Smith Animal Husbandry Farm, Liverpool (Jerseys)	72	22/2/47.
W. W. Martin, "Narooma," Urana Road, Wagga (Jerseys)	160	11/7/46.
Navua Stud Farm, Grose Wold, via Richmond (Jerseys)	120	8/10/47.
New England Experiment Farm, Glen Innes (Jerseys)	46	18/3/47.
G. H. Newnan, "Bunnigalore," Belangio (Jerseys)	38	2/12/46.
Peel River Land and Mineral Co., Tamworth (Poll Shorthorns)	110	16/10/46.
W. R. Raper, Calool, Culcairn (Beef Shorthorns)	86	12/2/47.
D. B. Reid, "Evandale," Sutton Forest (Aberdeen-Angus)	61	23/11/47.
Riverina Welfare Farm, Yanco (Jerseys) ...	130	26/6/46.
F. S. Simpson "Gunnawarra," Gulargambone (Beef Shorthorns)	167	19/11/47.
Trangie Experiment Farm, Trangie (Aberdeen-Angus)	155	11/3/47.
Wagga Experiment Farm (Jerseys)	15	1/2/47.
Wallaga Lake Aboriginal Station	19	29/4/47.
H. F. White, Bald Blair, Guyra (Aberdeen-Angus)	300	20/4/47.
Wollongbar Experiment Farm (Guernseys) ...	110	16/5/47.
A. Young, "Daylesford," Cudal (Beef Shorthorns)	23	25/2/47.
Herds Other than Registered Stud Herds.		
114 A.G.H., Kenmore...	70	6/6/46.
Aboriginal Station, Brewarrina	14	20/5/46.
Aboriginal Station, Wallaga Lake	19	29/2/46.
Australian Missionary College, Cooranbong...	100	30/8/47.
Barnardo Farm School, Mowbray Park ...	45	25/5/46.
Brookfield Afforestation Camp, Mannus ...	243	3/5/46
N. Cameron, Montrose, Armidale (Late New England Girls School)	33	20/2/47.
A. N. De Fraine, Reservoir Hill, Inverell ...	21	8/6/47.
Department of Education, Gosford Farm Home	37	26/2/47.
Ehsman Bros., Inverell	31	22/8/46.
Emu Plains Prison Farm	115	29/1/47.
Fairbridge Farm School, Molong	25	15/4/46.
N. L. Forster and Sons, "Abington," Armidale	62	24/5/48.
F. J. Foy, The Valley Farm, Megalong Valley	25	18/12/47.
W. J. Frizelle, Rosenstein Dairy, Inverell ...	134	16/8/47.
Goulburn District Hospital	5	6/11/46.
W. S. Grant, "Monkittee," Braidwood ...	23	29/4/47.
A. Hannaford, Braidwood	10	1/2/47.
F. C. Harcombe, Hillcrest Farm, Warialda Road, Inverell	53	10/4/47.
F. W. Hunt, Spencers Gully...	27	16/2/47.
Koyong School, Moss Vale	2	5/3/47.
J. H. Lott, "Bellevue," Rob Roy, Inverell...	41	26/6/47.
Lunacy Department, Callan Park Mental Hospital	43	4/4/47.
Lunacy Department, Gladesville Mental Hospital	20	15/4/46.
Lunacy Department, Morisset Mental Hospital	79	8/3/47.
Lunacy Department, Parramatta Mental Hospital	62	26/7/47.
Lunacy Department, Rydalmere Mental Hospital	57	30/10/46.
J. O. McGufficke, "Lovely Bank," Rob Roy, Inverell	33	25/6/47.
R. G. P. McLane, Ibis Valley, Swanbrook	24	23/5/47.
S. W. Morris, "Dunreath," Swanbrook Rd., Inverell	51	23/5/48.
J. A. Murray, "The Willows," Keiraville...	21	8/8/46.
New England University College, Armidale...	19	1/5/47.
Orange Mental Hospital	63	19/3/47.
Parker Bros., Hampton Court Dairy, Inverell	125	25/8/47.
Peat and Milson Islands Mental Hospital ...	25	6/9/46.
G. T. Reid, "Narrengullen" Yass	167	14/7/46.
C. E. D. Richardson, Kayuga Road, Muswellbrook	78	3/7/47.
V. J. Rolfe, "Mount View," Inverell ...	18	9/2/47.
St. Ignatius' College, Riverview	24	7/7/47.
St. John's College, Armidale	11	20/2/47.
St. Joseph's Orphanage, Kendall Grange Lake Macquarie	9	11/6/47.
St. Michael's Orphanage, Baulkham Hills ...	40	4/6/47.
St. Patrick's Orphanage, Armidale... ...	10	15/11/46.
St. Vincent's Boys' Home, Westmead ...	37	3/7/46.
State Penitentiary, Long Bay	13	30/11/47.
W. J. Stephenson, "Hill View," Fig Tree ...	53	1/2/47.
The Sydney Church of England Grammar School, Moss Vale	48	18/12/47.
J. M. Turnbull, "Pastime," Kayuga Road, Muswellbrook	85	20/3/47.
A. B. Weidman, No. 2 Dairy, Aberdeen Road, Muswellbrook	68	3/9/46.
A. B. Weidman, No. 3 Dairy, Kayuga Rd., Muswellbrook	38	6/9/46.
A. B. Weidman, No. 4 Dairy, Kayuga Rd., Muswellbrook	57	2/11/46.
T. J. Wilks, "Oaks Farm," Muswel brook ...	27	27/6/46.
William Thompson, Masonic School, Baulkham Hills	54	10/6/47.
A. G. Wilson, "Blytheswood," Exeter ...	66	23/4/47.
C. Wilton, Bligh Street, Muswellbrook ...	54	12/5/46.
Youth Welfare Association of Australia ...	142	19/3/46.

Tubercle-free Areas.

The following Areas have been declared tubercle-free and no cattle are allowed to be kept therein unless subjected to the tuberculin test and found free from tuberculosis :—

Bombala Area. Municipality of Muswellbrook. Inverell Area. Municipality of Queanbeyan. Braidwood Area

MAX HENRY, Chief of Division of Animal Industry.

Brucellosis-free Herd Scheme (Swine).

THE following is a list of the names and addresses of owners of herds which have been declared brucellosis-free in accordance with the requirements of the Brucellosis-free Herd Scheme (Swine). The work in connection with this scheme has been undertaken as part of the general campaign against this disease and should perform a valuable service to the industry generally. Owing to the limitations of staff it will not be possible for the Department to undertake the testing of herds in general for this purpose, and in future only herds belonging to Government institutions, registered stud herds, or those containing a preponderance of registered stud animals, will be accepted for inclusion in the list. A charge will be made for the work, since the inclusion of a herd in this list should be of benefit to the owner. After a herd has been accredited, two semi-annual tests will be required, and thereafter annual tests, provided that the conditions outlined in the agreement form are strictly adhered to and that negative results are obtained at each test. So far as the elimination of the disease is concerned, apart from placing the herd on the accredited list, this work will continue as at present.

Registered Stud Herds.

Bathurst Experiment Farm, Bathurst.
Boardman, C. M., "Fairmien," Camden.
Campbell, D., "Hillangrove," Wamberal, via Gosford.
Cocks, F. D., "Condalarra," Miranda.
Cowra Experiment Farm, Cowra.
Croft, F., Lugwardine, Kentucky.
Draper, R. E., "Glengar," Capertee.
Foley, J. B., Gundurimba Road., Loftville, via Lismore.
Garrison Battalion (2nd), Manly.
Gladesville Mental Hospital.
Government Agricultural Training Farm, Scheyville.
Grafton Experiment Farm, Grafton.
Harris, K. H., Pennant Stud Piggery, Purchase Road West Pennant Hills.
Hawkesbury Agricultural College, Richmond.
Holland, A. L., Argonne, Tubbul.
Hurlstone Agricultural High School, Glenfield.
Maybin, N. C., Towac, Orange.
New England Experiment Farm, Glen Innes.
Newington State Hospital and Home, Newington.
Ricketts, C. C., "Mangus," Young.
Riverina Welfare Farm, Yanco.
Rydalmere Mental Hospital.
Shirley, G. F., "Camelot," Penrith.
Upston, H. E., Wattle Tree Road, Holgate, via Gosford.
Wagga Experimen Farm, Wagga.
Waterfall Sanatorium, Waterfall.
White, A. N. Blakeney Stud, Orange.
Williams, G. R. B., "Gwandalan," Grenfell
Wollongbar Experiment Farm, Wollongbar.
Yanco Agricultural High School.

Herds Other than Registered Stud Herds.

A.G.H. (114 Australia).
Bathurst Gaol, Bathurst.
Brookfield Afforestation Camp, Mannus.
Callan Park Mental Hospital, Callan Park, Rozelle.
Emu Plains Prison Farm.
Glen Innes Prison Camp, Glen Innes.
Gosford Farm Home for Boys, Gosford.
Goulburn Reformatory, Goulburn.
Higgins, J. P., "Koranga," Camden.
Lidcombe State Hospital.
Morisset Mental Hospital, Morisset.
Orange Mental Hospital.
Parramatta Gaol, Parramatta.
Parramatta Mental Hospital.
Peat and Milson Islands Mental Hospital, Hawkesbury River.

Abortion-free Herds.

THE following herds have been declared free of contagious abortion (Bang's disease) in accordance with the requirements of the scheme of certifying herds abortion-free :—

Owner and Address.	Number in herd.
Registered Stud Herds.	
Armstrong, K. A., "Heathfield," Boorowa	23
Bathurst Experiment Farm (Guernseys)	28
Cowra Experiment Farm (Ayrshires)	55
Department of Education—Farm Home for Boys, Mittagong (A.I.S.)...	52
Dixson, R. C., "Elwatan," Castle Hill (Jerseys)... ...	22
Fairbairn & Co., C. P., Woomargama (Beef Shorthorns)	98
Farrer Memorial Agricultural High School, Nemingha (A.I.S.)	44
Forster, N. L., Abington, Armidale (Aberdeen-Angus) ...	167
Hann, O., Chatsworth Road, St. Marys (Jerseys) ...	14
Hann, O., "Bomerah," Barrington (Jerseys)	42
Hawkesbury Agricultural College, Richmond (Jerseys)...	96
Hicks Bros., "Meryla," Culcairn	65
Hill, E. Pritchard, Bowling Alley Pt. (Jerseys)	96
Hurlstone Agricultural High School, Glenfield (Ayrshires)	53
Killen, E. L., Pine Park, Mumbil...	141
McEachern, H., Tarcutta (Red Poll)	61
McSweeney, W. J., "The Rivers," Canowindra (Beef Shorthorns)	95
Martin Bros. "Narooma," Urana-road, Wagga (Jerseys)	160
Navua Stud Farm Grose Wold, via Richmond (Jerseys)	101
New England Experiment Farm, Glen Innes (Jerseys) ...	46
Peel River Land & Mineral Co., Tamworth (Beef Shorthorns)	100
Raper, F. S., Calool, Culcairn	80
Riverina Welfare Farm, Yanco	135
Scott, A. W., "Milong," Young (Aberdeen-Angus) ...	474
Simpson, F. S., "Gunnawarra," Gulargambone (Beef Shorthorns)	150
Training Farm, Berry	118
Trangie Experiment Farm, Trangie (Aberdeen-Angus)	155
Wagga Experiment Farm, Wagga (Jerseys)	25
Walker, Jas. R., "Strathdoon," Wolseley Park (Red Polls)	37
White, F. J., and Sons, Bald Blair, Guyra (Aberdeen-Angus)	152
Whitelaw, L. A., "Wendouree," Merriwa (Beef Shorthorns)	79
Wollongbar Experiment Farm (Guernseys) ...	110
Young, A., "Rocklynne," Cudal (Polled Beef Shorthorns)	27
Herds Other than Registered Stud Herds.	
A.G.H. (114th Australia)	66
Callan Park Mental Hospital	45
Department of Education—Farm Home for Boys, Gosford	37
Fairbridge Farm School, Molong	89
N. L. Forster and Sons, "Abington," Armidale ...	62
Morisset Mental Hospital	66
New England University College, Armidale	20
Orange Mental Hospital	61
Parramatta Mental Hospital	30
Peat & Milson Islands Mental Hospital	25
Royal Prince Alfred Hospital, Camperdown "Yaralla" Herd	94
Rydalmere Mental Hospital, Rydalmere	57
Salway, A. E., Cobargo	87

MAX HENRY, Chief of Division of Animal Industry.

Editorial—

Knows All the Answers.

THERE are no trade secrets in agricultural practice. If the answer to your farming problem has been worked out by research worker or experimentalist, the information is readily available for the asking.

If that fact were known to and made use of by every primary producer, farming methods, as generally applied, would be more up-to-date, products of the soil would be more efficiently and consequently more cheaply produced, and farming would be made more profitable to the individual.

The Department of Agriculture's aim is to "sell" to every one of the 73,000 primary producers in New South Wales, those agricultural practices which science, working hand in hand with progressive primary producers, has proved to be best. In this task it is faced with two problems: firstly, to convince producers of the soundness of its recommendations: and, secondly, to place those recommendations in their hands.

The Department is forced to expend much effort and money to break down indifference or opposition to its teachings—opposition based mostly on apathy, prejudice and sometimes antagonism. It is prepared to do this, knowing that once those obstacles are removed it has "the goods" to offer.

That progress is being made in this direction is evidenced by the growing demand for up-to-date farming knowledge. One example of this increasing demand is the ever-growing number of enquiries for printed information handled by the Division of Information and Extension Services of the Department.

THIS MONTH'S COVER.

It may come as a surprise to many readers that the tree-lined river which forms the subject of the cover block this month is the Paroo River, as it appears at Wanaaring—one hundred miles west of Bourke.

The Paroo rises in Queensland and flows southward, crossing the New South Wales border at Hungerford. It has no outlet, and does not normally reach the Darling River.

The photograph was taken in May of this year by Mr. A. N. Old, Analyst, of this Department.

In the past twelve months, written, personal and 'phone enquiries totalled 47,719 and 173,107 publications were distributed. Years of experience have shown the types

of publications best designed to answer most farming problems. About 500 pamphlets on different subjects are kept in stock and frequently revised to keep them up-to-date. They are concise and to the point, and with very few exceptions are free.

SUPPLIES ALL THE ANSWERS.

Write to the Department of Agriculture, Box 36A G.P.O., Sydney, for a copy of its "List of Publications."

This booklet contains titles of between 500 and 600 free pamphlets on farming subjects.

Keep a copy on the farm bookshelf and consult it whenever you are faced with a problem.

In addition, about one in every three farms throughout the State receives regularly the Department's monthly journal, "The Agricultural Gazette." Over 5,000 poultry farmers are supplied each month with "Poultry Notes."

Further, the agricultural press of New South Wales is kept posted with topical items of interest to farmer-readers. Main channel for supplying press information is the weekly broad-sheet, "Press Copy," which is posted to every newspaper, agricultural journal and radio news service in the State. Press releases of greater urgency are mailed from day to day. In the past year approximately 650 articles were contributed to newspapers through the channels mentioned.

Distribution of information in printed form, of course, is only one means by which agricultural knowledge is being disseminated by the Department of Agriculture. It is, however, one of the surest, quickest and most economical methods. Primary producers who are obtaining benefit from this service should mention the subject to their less knowledgeable neighbours, thus doing them and the Department and the State a good turn.

The Job Ahead of F.A.O. (Food and Agriculture Organisation).

THE vital importance of the soil in relation to human planning was emphasised recently by Mr. Clinton Anderson, United States Secretary of Agriculture:

"Can man live on the earth? Can we build the kind of world in which we want to live—a world where men can be free from hunger, a world where men can govern themselves without fear of despotism and tyranny? We cannot build that kind of world without adequate soil resources and the knowledge of how to use them for the benefit of all peoples.

"Soil to support productive agriculture is a fundamental basis of civilisation. The present world food shortage and the threat of famine that has come to many lands show that a narrow margin separates hundreds of millions of the world's people from actual death. If the world is to be well fed every nation must conserve its soil resources and must learn to use them wisely.

"Conservation farming during the war helped to increase production and production efficiency. Many farmers have demonstrated the value of many conservation practices and techniques—terracing, contouring, use of fertiliser and organic matter, crop rotation, tree planting, drainage, irrigation, and many others.

"But not only must we put each acre of our own land to its proper use—we and all other nations of the world must share our conservation knowledge. The United Nations have set up an organisation whose job is to make such knowledge available. It is the Food and Agriculture Organisation. We can be thankful this organisation is alive and working. All of us have vital concern in restoring soil and its abundance in other lands as well as here. Only in that way can the world achieve freedom from hunger, and only by achieving that freedom can democracy live in world community."

Approved Seed—September, 1946.

To assist in the production and distribution of approved seed of recommended varieties of crops and vegetables, the Department publishes in this list each month the names and addresses of growers of such seed.

Cauliflower—

Shorts—H. Burton Bradley, Sherwood Farm, Moorland.

First-grade Lambs with U-shaped and Well-filled Quarters.

Possible Trends in—

FAT LAMB PRODUCTION.

The Influence of Returns from Wheat, Mutton and Wool.

J. M. COLEMAN, Special Sheep and Wool Instructor.

IN any survey of the possible post-war development of fat lamb production the economic aspect cannot be overlooked, as it plays such an integral part in and is, in fact, almost entirely responsible for the production plane of various industries, more particularly in the mixed farming areas.

The bulk of our fat lambs is produced either in the mixed farming districts or the higher rainfall tableland areas, and these areas also produce large quantities of cereals and fine Merino wool respectively. Should the returns for wheat and fine wool be more attractive than for lambs, then the plane of lamb production will be materially affected.

In these areas an immediate change of production can be made without any drastic alteration of procedure or large expenditure of money. It is, therefore, difficult to forecast with any degree of accuracy, future trends in lamb production as they must be shaped by the prices offering for various other commodities.

For a period of ten years prior to the war, the fat-lamb industry showed a steady expansion in production, and it reached a maximum level during the war year ending June, 1943.

*The table on page 452 shows the total of mutton and lamb products in New South Wales for each of the ten years prior to the war, together with the quantity of lamb exported for the same years.

This increase was, in the main, exported, although a small portion was used in the local trade to cater for an increased population during that period.

During the war years, until the drought of 1944-45, the increase was even greater, but the quality of the product was not maintained—in fact, there was a minimum regard for quality.

The Export Trade.

In considering post-war trends, it is necessary to review the subject as it concerns both the export and the local trade. In the

former case, other lamb-producing countries have substantially increased their production during the war years, and in view of the fact that pre-war Australasia produced approximately 85 per cent. of the lambs absorbed on the United Kingdom market, it is difficult to imagine any substantial increase in production for the United Kingdom markets.

N.S.W. MUTTON AND LAMB PRODUCTION, 1928-39.

Year.	*Mutton and Lamb Production.*	*Lamb Exported.*
	(000 tons)	(000 tons)
1927-28	84·9	4·4
1928-29	84·3	4·4
1929-30	106·2	8·0
1930-31	104·8	9·6
1931-32	131·8	19·9
1932-33	144·3	17·0
1933-34	114·0	21·0
1934-35	110·4	17·5
1935-36	96·5	17·4
1936-37	101·7	18·6
1937-38	109·3	17·5
1938-39	100·7	15·2

The unofficial figures of Argentine lamb export during recent years are:—1942, 3,000,000 carcases; 1943, 4,700,000 carcases, and 1944, 6,400,000 carcases; while the exportable surplus in New Zealand increased up to 16 per cent. during the war years.

Before the war the United Kingdom offered the only overseas markets for fat lambs; however, post-war developments may reveal potential markets in other countries, such as United States and Canada.

Local Market Prospects.

There is undoubtedly room to expand the local market, but any expansion in this direction will, to a large degree, be at the expense of mutton, particularly aged wethers and ewes. The economic position of properties which are purely wool producing and situated in the tableland areas of the State is such that any weakening of the market for disposal of their aged sheep would have dire effects.

It would appear, therefore, that there is a definite limit to the expansion possible in either the export or local market.

The Swing Towards Crossbreds.

During the past five or ten years there has been a very marked increase in the percentage of crossbred sheep in the State. For many years the ratio was in the vicinity of 85 per cent. Merino to 15 per cent. other breeds. The most recent data available from the Statistician (1942) indicates that the percentage of Merino sheep had dropped to 79 per cent. in that year, but it is generally agreed that the percentage of Merino sheep now is much lower. The swing to crossbred sheep has taken place chiefly in the central and southern tablelands and slopes where country of mediocre nature has been considerably improved by the application of superphosphate. Not only is the carrying capacity increased, but also the resultant pastures are more suited to crossbred sheep than to the Merino. The changeover in most cases is being effected gradually by joining long-wool and Corriedale rams with Merino ewes with the ultimate object of breeding Comeback and crossbred types.

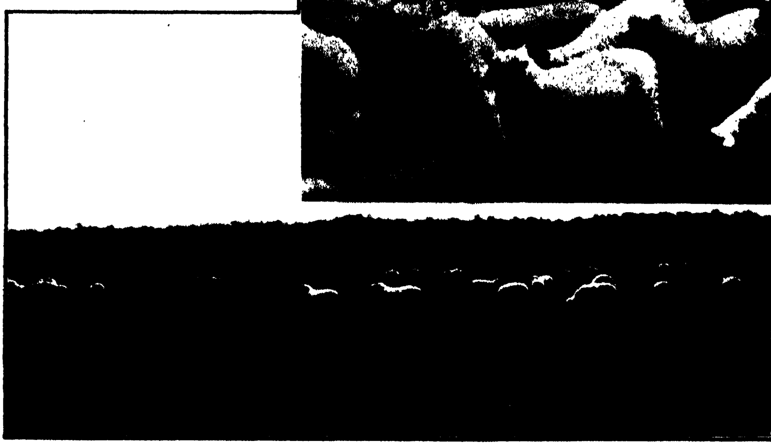
It is difficult to assess the increase in production that may occur as the result of this

Dorset Horn Cross Lambs, 3 Months Old.

change. It is certain, however, that substantially more lambs will be produced, but mostly at the expense of Merinos. In the overall the number of sheep available for slaughter will be greater and more mutton will be produced. This development will assist materially with the all-important problem of continuity of supplies for killing units, by "spreading" the season.

In addition to the trend to crossbred sheep in the developed country in these areas, further expansion is possible in the undeveloped areas of the tableland districts. This expansion is greatly dependent in the first place upon supplies of superphosphate.

Right. Good Type of Crossbred Lambs.



Left.—Good Pastures are of Prime Importance in the Raising of Fat Lambs.

Post-war Wool Prices.

In the tableland areas under discussion the development of lamb or mutton production will be influenced very largely by the prices of fine and superfine Merino wool, and in this regard it is freely rumoured in the wool trade that super-fine wool will increase in price by approximately 20 to 30 per cent. following the termination of the appraisement scheme.

It will be recalled that a few years after the last war, superfine Merino wool reached the record price of 53¼d. per lb. Should a phenomenal demand again occur, it is safe to assume that sheepbreeders in the tablelands will continue with Merino flocks for the production of superfine wool in preference to crossbred sheep in lamb production.

Influence of Wheat Prices.

The bulk of our fat lambs is produced in the cereal areas where diversified farming is practised, and here again the prices for other commodities will, to a large extent, determine the volume of fat-lamb production. Following the last war the price of wheat rose to the vicinity of 8s. per bushel, and it is certain that should an attractive price again offer for wheat, many mixed farmers will expand wheat production and will automatically reduce the size of their lamb flocks.

Possibilities on Irrigation Areas.

Possibly the greatest expansion in lamb production will take place in the new irrigation districts in the Murray and Murrumbidgee areas, where previously large Merino flocks were depastured. Under irrigation this extensive area is admirable lamb-raising country. Many of the lambs produced in the irrigation areas, however, are marketed in Victoria; it is estimated that in pre-war years approximately one million lambs bred

in New South Wales were marketed each year in Melbourne. The establishment of a killing works at Wagga will result in many of these lambs being slaughtered at that centre.

The Agreement with the British Government.

The present long-term meat agreement between the British and Australian Governments, although subject to periodical review, will be in operation until 1948. This, in itself, should ensure a satisfactory price for meat and also be a big influence in maintaining a profitable price for mutton and lamb, particularly the latter. On the other hand, the price fixed by the British Government for wool terminated on 30th June this year, and as there are large surpluses of wool both in Australia and overseas, it is possible that the price of wool, other than superfine, will not experience a buoyant market. Should this be the case, there will be a further trend from Merino wool production to dual-purpose sheep-raising. Actually the wool return from a dual-purpose flock run in the cooler slopes and tableland areas is very satisfactory, and compares favourably with that of a Merino flock, whilst in addition, fat sheep can be disposed of at much more satisfactory prices.

Lambs From the Marginal Areas.

Different circumstances influence lamb production in the "marginal" areas. This tract of country, although not recognised as part of the lamb belt, produces a great number of lambs when seasonal conditions are favourable. The Trangie district—a typical marginal area—provides an excellent example of the fluctuation in production from year to year due to seasonal conditions. This area, with a limited growing season, produces up to 300,000 lambs in very favourable years, and in dry years none at all.

New South Wales and Victorian lamb breeders very largely procure their breeding ewes from these marginal areas; however, when attractive lamb prices are offering many potential breeders are sold as lambs.

A Summary.

It would appear, from a survey of the conditions likely to influence the situation, that should markets and prices remain stable and not be influenced by a phenomenal demand for any one product, lamb production will continue to expand steadily during the next five years. Any increase or decrease in production that may occur will be largely the result of prices offering for other products of lamb-raising areas.

Agricultural Societies' Shows.

SECRETARIES are invited to forward for insertion in this list dates of their forthcoming shows; these should reach the Editor, Department of Agriculture, Box 36A, G.P.O., Sydney, not later than the 15th of the month previous to issue. Alteration of dates should be notified at once.

1946.

Forbes (J. T. Woods) .... September 3, 4
Manildra (E. S. Parker) ...... September 3, 4
Young (T. A. Tester) .... September 3, 4
Coolamon (R. G. Lynch) .... September 6, 7
Lockhart .... September 7
Deniliquin .... September 7
Cowra .... September 10, 11
Henty .... September 10, 11
West Wyalong .... September 10, 11
Narromine .... September 11, 12
Corowa (W. T. Easdown) .... September 13, 14
Narrandera (T. L. Ball) ...... September 13, 14
Temora .... September 18, 19
Leeton (E. C. Tweedie)...... September 20, 21
Murrumburrah (R. J. Simpson) September 24, 25
Quandialla .... September 25
Eugowra (Miss P. Casey) .... September 25
Ariah Park (F. Meacham) ...... September 25
Ardlethan (E. C. Knight) .... September 27
Finley .... September 28
Mangrove Mountain Agricultural Bureau (Mrs. Roberts) .... September 28
Griffith .... October 1, 2
Walbundrie (C. Lieschke) .... October 2
Bribbaree .... October 2
Singleton (N. Shaddock) .... October 3, 4
Albury (A. G. Young) .... October 8, 9, 10
Lismore—North Coast National Exhibition (C. C. Dean) .... October 15, 16, 17
Holbrook .... October 25, 26
Murwillumbah (J. L. Banner) .... October 30, 31
Bangalow .... November 12, 13

1947.

Queanbeyan (D. Vest) .... February 21, 22
Tumut .... March 4, 5

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FODDER CROPS FOR THE UPPER NORTH COAST.

As Supplements to Pasture.

Cultural Methods and Planting Tables.

G. GILES, H.D.A., H.D.D., Senior Agricultural Instructor.

CONDITIONS in the dairying industry demand that for successful carrying on of the industry, the maximum returns must be obtained both per acre and per cow. At present the greatest falling off in production and condition of stock occurs during winter, and in the periodical dry periods which are often experienced in the spring.

The purpose of this article is to deal with the possibilities of overcoming the drop in production, as far as practicable, by the use of supplementary crops and temporary winter pastures of Italian Rye grass and Red clover. Under very severe conditions where crop growth is insufficient to provide the fodder necessary to prevent a falling off in production, it is necessary to use conserved fodder. This conservation is a subject in itself and it is not proposed to deal with it in this article.

A productive mixed pasture of grasses and clover is the best single stock feed, and on the North Coast must be regarded as the most important crop on the farm. No artificial feed can compete in cheapness with pasture, but to rely entirely on pastures, is to fail in obtaining the principal advantages of these pastures.

Factors Influencing Production.

Paspalum and kikuyu pastures make excellent growth during the summer months, whenever the rainfall is sufficient, but they deteriorate rapidly during the autumn. Every dairy farmer has experienced the rapid increase in production, following rains in the spring and summer, and also the decline in production during March, April and May when the feed, although plentiful, becomes harsh and unpalatable. The rapid increase as a result of the growth of young grass, is due to the high protein content of this material, which equals, on a dry weight basis, many of our best concentrates. As the grass becomes older and coarser, the protein content is lowered, with the result that the old grass in the autumn, although abundant, is of poor feeding value. This effect can be overcome to some extent by mowing the old grass, thus promoting a fresh growth, but even this practice fails to maintain production in the late autumn when the grass growth becomes slower, and, insufficient to provide enough feed for the stock.

By supplementing the failing grass with green fodder crops and temporary pasture, production can be maintained through the period when paspalum and kikuyu pastures are non-productive. By a series of plantings in the spring and summer months, fodder can also be available to supplement any failing pastures as a result of erratic rainfall.

Once an animal becomes reduced in flesh, let the owner attempt to bring it up again to its condition of greatest usefulness as a producer, and he will have brought home to him how great his loss has been through sparing the feed. Other things being equal, the animal that consumes the greatest amount of feed gives the best return. It is also clear that if an animal gets only sufficient food for its bare subsistence, the farmer gets nothing in return for his feeding. It is the amount in excess of the vital demands of the animal that is devoted by it to the formation of the product which provides a return for the farmer.

Even when grass is in comparatively good condition during late summer, a rise in production can be obtained by grazing on crops high in protein—such as lucerne, Poona cowpeas or young Japanese millet.

Treatment of Old Cultivation and Pasture Areas.

When an old paddock is being "let out" of cultivation, the best use can be made

of it by growing Poona cowpeas during the summer and then sowing down to Italian Rye grass and Red clover during the autumn. These plants often make disappointing growth on old cultivation land without a preliminary green crop as, for best results, they need high fertility.

When restoring an old cultivation paddock to pasture, it is advisable to mix a few pounds of paspalum with the rye grass and clover.

To renew old matted paspalum paddocks, the best method is to mouldboard plough or rotary hoe during autumn, and plant a crop of grazing oats, follow the oats with a late November or early December crop of maize for grain sown in rows 4 feet 6 inches apart; keep the maize well scuffled and in March, plant a mixture of Italian Rye grass and Red clover through the rows of maize, covering with a single leaf of a harrow drawn between the rows. The scuffler is not suitable for covering, as it buries the seed too deeply and the germination is affected. When the maize is pulled in June, excellent grazing will be available, and sufficient paspalum will have persisted to restore it to paspalum pasture in one or two years.

The practice of topdressing pastures with superphosphate is also an aid to producing better feed, particularly by encouraging White clover, not only during late winter and spring, but at other periods of the year, thus improving the protein content of the pastures generally. In connection with this practice, however, it must be borne in mind that some of the red volcanic soils, owing to their chemical nature, do not respond to superphosphate, and on these soils, topdressing with superphosphate cannot be recommended.

Suitable Leguminous Crops.

Leguminous crops which are suitable for fodder on the Upper North Coast are:—

Lucerne.—Rightly named the "King of Fodders" owing to its high feeding value. The best crops are produced on rich, alluvial flats, but it is being successfully grown on a wide range of soils. It can be fed with advantage to stock all the year round, even in the flush of the season, so as to balance the ration. It can be utilized by grazing or cut and fed green, or it can be dried as hay and fed during lean periods.

Planting is normally carried out in April and May at the rate of 10 to 12 lb. of seed per acre broadcast, using the higher quantity of seed on the better lucerne lands. The seed bed must be thoroughly prepared so that it is fine, firm and free from paspalum. Where superphosphate responses are obtained, it is particularly beneficial to lucerne at the time of establishment and as an early spring topdressing.

Renovating is essential, to obtain the maximum life from a lucerne stand.

Cowpeas.—A summer growing legume, and should be sown from September to December. They can be broadcasted at the rate of 1 bushel per acre or drilled 2 feet 6 inches apart at 15 lb. per acre, if large-seeded varieties such as Black are sown; half these quantities with Poona. They can with advantage be sown in early maize crops at the last scuffling. This crop is particularly valuable in improving the fertility of the soil, and although when first turned in on cowpeas, cattle will not eat the crop, they quickly acquire a taste for the fodder, which is immediately reflected in increased milk yield. The outstanding variety is Poona.

Field Peas are a winter-growing legume, planting being carried out from March to May, broadcasting 1 bushel if sown alone or ½ bushel sown with 60 lb. of wheat, oats or barley. Grey is the variety usually grown but is rather late maturing. For planting with cereals, Lima and French Grey are better varieties. Field peas are not relished by stock when green and succulent, but are eaten readily if cut and wilted, or else allowed to approach maturity.

Tares and Vetches are also winter growing legumes. They are more palatable than field peas, but rather late in making their main growth. The vetches (Woolly Podded and Purple) are superior to the Golden Tare. Sowing rates are 30 lb. per acre of tares, and 15 lb. vetches.

Berseem Clover is very popular with some farmers for cutting and grazing. To obtain best results a March planting is the most reliable, and heavy soils give better results than the lighter types. A suitable sowing rate is 12 lb. per acre on a fine, well-prepared seed-bed.

Legumes give better results from the application of superphosphate than other

types of crops, where a superphosphate response can be obtained.

Cereals and Miscellaneous Crops.

Maize.—Green maize is a very valuable supplementary feed, particularly when fed in combination with a protein-rich fodder.

By planting at intervals of a month to six weeks from the time frosts cease, until mid-February, a continuous supply of fodder can be made available from the end of November until May.

The spring plantings are generally of particular value during dry spells in early summer, while the late summer plantings are of value in supplementing the failing pastures at the end of autumn.

A better type of feed, which is easier to handle, is obtained by planting in rows in preference to broadcasting. Where definitely required for green feed, sowing in 3 feet rows at the rate of 20 to 25 lb. per acre is recommended, but, where it is doubtful whether the crop will be for green feed or grain, sow in 4 feet rows at 10-12 lb. per acre. The best time to cut for green feed is when the cobs are in the "roasting" stage. Fitzroy is particularly recommended as a fodder or grain variety and Leaming, Golden Nuggett, Giant White and Golden Superb are useful varieties.

Sweet Sorghum has a definite place on practically every farm. When planted in December and January, it will produce a heavy crop which maintains its succulence well into the winter. In warmer localities, it can be used for feeding to the end of July.

Saccaline is the most popular variety; it is late maturing and stands well; White African is also a late maturer and usually gives a heavier crop than Saccaline, but is rather brittle, so that it should not be sown where it is exposed to very strong winds.

Early Orange is a quicker maturer than Saccaline, so that when sowing is delayed for any reason, it is preferable to sow Early Orange in order that maturity may be reached before frosting occurs.

Sowing thickly in rows 3 feet apart, using 8-10 lb. of seed per acre, is preferable to broadcasting, but where the latter has to be adopted, a seeding of 25-30 lb. is necessary.

Wheat.—Wheat does not stand grazing as well as oats, but when sown at 90 lb. of seed per acre in April, is very useful for cutting and feeding at the end of August and early September.

Oats.—Still one of the most popular winter fodders; sown in March to May, at the rate of 2 to 3 bushels per acre, it is particularly valuable where the seed bed cannot be worked sufficiently for Rye grass and clovers.

If the feed is required during the early part of the winter, Fulghum is the best variety for grazing, but if late winter and spring grazing is desired, Algerian is the better variety. For cutting and feeding in early Spring, Buddah is the best variety, replacing the formerly popular Sunrise; Buddah is resistant to stem rust, although, like all oats, subject to leaf rust.

Rye, or as it is popularly known, "Rye Corn," is a quick-growing crop, which will stand up to more adverse conditions than wheat or oats. To obtain the best results, it should not be allowed to grow above 9 inches high before grazing, as once it comes into head, it is too fibrous for fodder purposes. Black winter is the best variety, sown at 90 lb. per acre.

Barley, either Skinless or Cape, gives occasional good crops, but although very palatable, is out-yielded by the other winter cereal crop.

Italian Rye Grass and Red Clover is the best quality winter and early spring grazing, which can be provided on the North Coast, but if the correct conditions do not exist, grazing oats are superior.

The land for this temporary pasture should be in a fertile condition, such as occurs immediately after a green manure crop, and the seed bed should be well worked to a fine, firm state. Sowing should take place at the end of March or early April. The best type of Rye grass to use is Certified Italian. Seeding with 15 lb. of Italian Rye Grass and 5 lb. Red clover is suitable for rich land, but needs to be adjusted to local conditions—where the soil fertility is lower, reduce the amount of Rye grass or where Red clover grows very freely, reduce the Red clover seed.

A very successful method of growing this mixture is to plant between the rows of late-planted grain maize, on good soil, which

has been kept free of weeds, lightly covering the seed with a single harrow leaf drawn up and down the rows. Again, on country suitable to Red clover, this plant may be established on friable, open, textured soil, by sowing oats, grazing until early June, and then sowing 5-6 lb. of Red clover alone on the stubble, and harrowing in; this gives a pure Red clover growth in the spring, when it may be used as feed, or for ploughing in to improve the land.

Canary Grass.—This winter-growing fodder is of value on the heavier types of land, where the nitrogen content of the soil is high. A firm, well-worked seed bed is necessary to obtain a good germination; sow during March to May at the rate of 12 lb. per acre.

Millet.—Fodder millet is useful as a quick-growing, grazing catch crop, and may be sown from September to February, using 12 lb. of seed per acre; it prefers the heavier types of soil. It is preferable to Sudan Grass, where the rainfall is sufficient. Japanese is the best general purpose type; it can be grazed hard and recovers well after grazing, but successive sowings should be made to ensure maximum benefit. It is highly regarded by dairy farmers as a milk producer.

Sudan Grass.—The greatest merit of this fodder is its drought resistance. Seed is sown at the rate of 15 lb. per acre during September and October. Although it is usually grazed off, there is definitely a risk of poisoning with this fodder, up to the time of heading; this is particularly the case where sorghum hybrids are present in the crop.

Sugar and Fodder Canes.—These are the stand-by crops of the North Coast and are sometimes spoken of as the "North Coast Silo." Fed alone, they will maintain stock in condition, but a protein supplement is necessary to obtain milk production. They are of particular value during dry spring periods when other fodders are not available.

The following table gives particulars of the times and methods of sowing the various fodders suited to the Upper North Coast, and shows when they are available for feeding.

A SOWING TABLE FOR FODDER CROPS.

Crop.	When to Sow.	How to Sow.	Quantity of Seed Per Acre.	Available for Feeding.
Maize, green ...	Sept. to Feb. ...	Drills 3 feet	20-25 lb. ...	Dec. to May.
Maize, green and grain	Sept. to Jan. ...	Drills 4 feet	10-12 lb. ...	Dec. to April.
Sorghum	Dec to Jan.	Drills 3 feet ...	8-10 lb. ...	April to July.
		Broadcast	30-40 lb. ...	April to July.
Cowpeas	Sept. to Dec. ...	Broadcast	60-lb. (Poona, half quantity)	Dec. to May.
		Drills 2 ft. 6 ins. ...	15 lb. (Poona, half quantity)	" "
Wheat	Mar. to May ...	Broadcast	90 lb. ...	June to October.
Oats...	Mar. to May ...	"	80-120 lb. ...	" "
Rye	Mar. to May ...	"	90 lb. ...	" "
Wheat, oats or rye with legume ...	Mar. to May ...	"	Cereal, 60 lb. legume, 30 lb.	" "
Field peas	Mar. to May ...	"	60 lb. ...	June to October..
Tares	Mar. to May ...	"	30 lb. ...	" "
Vetches	Mar. to May ...	"	15 lb. ...	" "
Berseem clover ...	Mar. to Apr. ...	"	12 lb. ...	" "
Italian—Rye grass	Mar to Apr. ...	"	15 lb. ...	" "
Red clover			5 lb.	
Sugar cane / Cow cane ...	Sept. to Nov. ...	Rows 4 ft. 6 ins. or 4 ft. each way.	15-20 cwt. "Sets."	Perennial.
Millet (Japanese) ...	Sept. to Feb. ...	Broadcast	12-15 lb. ...	November to May.
Pumpkins	Oct. to Dec. ...	12 ft. x 12 ft. Hills ...	2 lb. ...	April to August.
Mangolds	Mar. to Apr.... ...	Drills 3 feet	6-8 lb. ...	Oct. to December.
Sweet potatoes ...	Sept. to Dec. ...	Drills 3 feet	Shoots ...	May to September.
Lucerne	Mar. to May... ...	Broadcast	10-12 lb. ...	Perennial.
Canary grass ...	Mar. to Apr.... ...	"	12 lb. ...	June to September.

Planting is by sets either continuously in rows 4 feet 6 inches apart, or double or treble "setted" 4 feet apart each way, in September and October, requiring 15 cwt. to 1 ton of sets per acre. The softer the cane the more valuable the crop is for fodder purposes. The best varieties in order of increasing hardiness but decreasing softness are:—Broadwater No. 1, Chin Chin, Improved Cow Cane and Indian Cane. The crop is particularly responsive to applications of nitrogenous fertilisers such as sulphate of ammonia. Owing to the number of diseases attacking cane, care should be exercised to obtain sets only from a clean crop.

Mangolds are grown by some farmers, but a large amount of attention is necessary in the early stages of growth. Autumn planting is the only practical period, owing to the heavy spring weed growth. Planting is done in rows 2½-3 feet apart, using 6-8 lb. of seed per acre.

Sweet Potatoes can be used for feeding cattle as well as pigs. The vines make good grazing, while the tubers are good fodder if a surplus over pig requirements is available, and the market price is not attractive. The most suitable variety is White Maltese.

Pumpkins can be used in a similar manner, being planted either through the maize crop or as an individual crop.

A Fodder Crop Programme.

Utilizing the sowing table, programmes similar to the following may be designed, wi h variation according to the individual farm and the inclination of the farmer. The programme shown is suitable for warm areas with little frost.

Month.	Planting.	Feeding.
January ...	Maize, sorghum, millet	Maize, cowpeas, millet.
February ...	Maize, sorghum, millet	,, ,, ,,
March	Cereals, Italian Rye grass and Red clover.	,, ,, ,,
April	Cereals, Italian rye grass and red clover.	,, ,, ,,
May	Cereals.	,, ,, ,,
June	....	Sorghum, cereals (grazing), Italian rye and Red clover.
July	....	Sorghum, cereals (grazing), Italian rye and Red clover.
August ...	....	Sugar cane, cereals (grazing and cutting), Italian rye and Red clover.
September ...	Maize, cowpeas, millet	Sugar cane, cereals (grazing and cutting), Italian rye and Red clover.
October ...	Maize, cowpeas, sugar cane.	Sugar cane, Italian rye and Red clover.
November ...	Maize, cowpeas, sugar cane.	Sugar cane.
December ...	Maize, sorghum, millet	Maize, cowpeas, millet.

With increasing severity of the winter, the summer crop season becomes shorter and more reliance must be placed on winter-growing crops, grasses and clovers.

Lucerne as grazing, fed green or as hay, is an excellent supplement to any programme of feeding, and will result in increased production, especially from crops such as cane.

The amount of feeding required is dependent on the pasture available.

To be sure of production, some form of conserved fodder is necessary to carry over periods when both crops and pastures fail.

Propagation of Sweet Potato Plants.

THE plants necessary for producing an early crop of sweet potatoes are obtained by placing the roots —usually small, slender ones kept over for the purpose from the previous season—in sand in a cold frame or hot bed. The tubers should be placed close together, but not touching, and then covered with 3 or 4 inches of moist sand (river sand preferred), and protected with a glass sash or a hessian frame.

By raising a corner of the frame enough air can be admitted to prevent rot setting in. The bed should be kept moist, but not wet, and covered until the plants show through the sand, when the covering should be removed during the day-time but replaced at night. This is done until all danger of frost is past. The "plants," when 6 or 8 inches long, are ready for planting out.

By bedding the roots early, the addition of bottom heat is unnecessary in comparatively warm districts. If tubers are set in the frame about the end of July or beginning of August, plants will be ready as early as it is safe to put them out. Plants raised on sand, and without artificial heat, are hardier than if raised in a rich compost and on a hot bed, and, in addition, the risk of introducing disease is lessened. In a cold district, or where bedding-down has been delayed, it will probably be found necessary to use some sort of bottom heat.

One or two roots, bedded in a small box or kerosene tin, if placed in a sunny situation, and covered at night, will supply sufficient plants for a kitchen garden.

Factors Influencing—

SUCCESSFUL STORAGE OF THE WHEAT HARVEST.

The Growers' Responsibility.

L. S. HARRISON, Wheat Commissioner and Manager, Government Grain Elevators.

IF the grain harvested from this year's wheat crops is to be stored successfully until it is required for use, then it is essential that every effort be made to ensure that it is not exposed to weevil infestation and is taken into storage in the most suitable condition.

The treatment of the grain by growers during harvesting and transport has considerable influence on the possibility of infestation and consequently on the storage life of the grain. The purpose of this article is to indicate methods by which wheat growers can do their part in reducing the risk of weevil infestation to a minimum.

If the risk of weevil infestation is to be reduced to the minimum, five practices must be recognised by the grower as dangerous:

1. The delivery of immature or unevenly ripened grain.
2. The delivery of grain with an excessive moisture content from any cause.
3. The delivery of wheat containing chaff, straw and black oats or other foreign material.
4. The use of unclean harvesting machines.
5. The use of unclean bags.

Danger from Prematurely Harvested Wheat.

It has been proved beyond dispute that wheat that has been prematurely harvested is not a storable commodity and constitutes a menace to wheat stored with it. When delivered to silos and mixed with clean dry wheat, it forms pockets liable to heating; and whether bagged or in bulk it will provide weevils with favourable conditions for rapid breeding, resulting in the build-up of a local infestation which will be a danger to any grain in the vicinity.

Contamination from Infested Harvesters.

It is important to realise that the wheat which will be contaminated by an infested harvester is the first-gathered grain, which is particularly liable to provide favourable conditions for weevil multiplication. Farmers should therefore make a special point of cleaning their machines thoroughly before the harvest. Any grain found in the boxes should be removed and destroyed (preferably burnt) immediately; and if any trace of weevils can be seen the hoppers should be treated with a liberal dose of a commercial fly spray, which is quite effective against these insects.

Contaminated Delivery Bags.

Wheat remaining in the seams of delivery bags will become infested by weevil, and it should be the grower's practice to take precautions against this immediately after harvesting by turning the bags inside out, and thoroughly shaking or brushing out any residue of grain. If this treatment has been neglected, it should be seen to without delay, care being taken to select a place away from any area where wheat is to be stacked.

If the necessary facilities are available on a farm, one way of ensuring thoroughly clean delivery bags is to pack them in a bin that can be made reasonably air-tight, and treat them with a suitable fumigant.

Contamination by Old Wheat.

The danger of wheat picking up contamination from infested harvesting machinery or delivery bags, though real and serious enough, is small compared with that resulting from any admixture of previous season's grain—say unused seed or feed wheat. Such wheat may carry an infestation several thousand times as heavy as an equal quantity of grain contaminated from machinery or bags.

Storage on the Farm.

Transport problems may delay the clearance of this season's wheat. Should it become necessary for a farmer to hold the

(*Continued on page* 472.)

THE AGRICULTURAL BUREAU

OF NEW SOUTH WALES.

Its Purpose and Activities.

Form a Branch in Your Locality.

H. PARRY BROWN, B.Sc.Agr., Acting Organiser.

INNUMERABLE inquirers are approaching the Department of Agriculture for information concerning the Agricultural Bureau of New South Wales. They ask: What is it? What are its functions? What does it do? How does one join?—and it is to answer these questions that the following information is given.

The Agricultural Bureau is a State-wide organisation of rural people, with branches based on farming localities (rather than the rural towns or cities); with sub-district or district councils, representative of small groups of neighbouring branches; divisional councils (eighteen in number); and a State Advisory Council, which is annually elected by the branches, each Division being represented on it. The State Advisory Council also includes two women representatives.

There are Agricultural Bureau branches in hundreds of farming localities. The potential number is limited only by the number of localities willing to form a branch. Membership of a branch is open to any person in the locality—man, woman or youth. Minimum membership of a branch is twenty.

Membership fees are decided by the local branch in adopting a local Constitution. They range from 5s. to 10s. for full members and 1s. to 2s. 6d. for associates, *i.e.*, women and youthful members.

Objects of the Organisation.

The purposes of the organisation may be briefly stated as follows:—

(*a*) The promotion of rural adult education in general and agricultural education in particular—by making information available to members through lectures, discussions, demonstrations, films, field days and such other aids as may be possible.

(*b*) The organisation of co-operative, group effort to improve local

Delegates Arriving at Hawkesbury Agricultural College for the 1946 State Conference.

The Department makes the College available each year to house delegates. Not only does this mean excellent facilities for indoor and outdoor sessions, but it enables the delegates to make many valuable contacts and friendships in between the sessions.

[*Photo by R. D. Meaker.*

The Agricultural Bureau Youth School

At Hawkesbury Agricultural College.

Above.—Young Members of Branches of the Agricultural Bureau who attended the Youth School held at Hawkesbury Agricultural College from 22nd to 27th July.

The course comprised training in presidential and secretarial duties, and included such subjects as public speaking, debating, conduct of discussion groups, staging of discussions, reporting and minute writing, press and radio publicity and use of movie projectors.

Above and at Left.—The Youth School in a General Session at the College.

At other times the school was divided into separate groups for more intensive practice in such subjects as public speaking and discussion group method.

[*Photos by R. D. Meaker.*

facilities, conveniences, living and social conditions.

(*c*) The training of its members in citizenship, leadership and community responsibilities.

The Assistance Given by the Department of Agriculture.

The Agricultural Bureau was founded by the Department of Agriculture in 1910 as a "student body" to disseminate information and organise educational activities in the rural areas.

Branches are subsidised by the Department of Agriculture at the rate of 5s. for each £1 of annually-collected membership fees. The Department also provides an Organiser, a Secretary for the State Advisory Council, and a central office within the Department's Division of Information and Extension Services. It also provides travelling expenses and sustenance allowance for the members of the Advisory Council, which meets in Sydney or at Hawkesbury Agricultural College on four occasions each year. Hawkesbury College is also made available for the annual State Conference, when some 300 men and women delegates are in residence for a three-day programme of educational sessions.

In addition, of course, the Department's field and research officers, and the Women's Extension officers are available—free of expense to the Agricultural Bureau—for educational activities organised by the branches or councils.

Notwithstanding the subsidy and general assistance provided by the Department of Agriculture, the Agricultural Bureau remains an autonomous, farmer-controlled organisation. There are many institutions, in addition to the Department of Agriculture, anxious to provide service. These institutions are free to use the Bureau, and they do so, because the Bureau branches and councils are valued links with the rural people. Similarly the Bureau units are free to make independent contacts with institutions other than the Department of Agriculture.

Party-political and Sectarian Issues Banned.

The Agricultural Bureau of New South Wales firmly excludes party-political or sectarian discussions or actions from its activities.

Not Competitive with Other Associations.

The Bureau is not in competition with the various industry associations of primary producers. On the contrary it provides supplementary strength since it develops a

A Demonstration of the Application of Practical Results of Research.

A veterinary officer showing Agricultural Bureau members how to conduct a post mortem to investigate the presence of worms in sheep.

Bureau Members and the District Instructor Inspecting Pasture Trials conducted in Co-operation with the Department of Agriculture.

regular information service in the locality and, importantly, develops in local people the quality of self-expression, an ability to analyse and appreciate facts, an ability and willingness to accept responsibility in the fulfilment of community needs.

In recent times local branches of other associations of primary producers, and rural people in general, have been taking such actions as the appointment of a "special-purpose sub-committee" to organise a local branch of the Agricultural Bureau to handle educational activities.

Typical Activities of the Bureau.

Objectives of the Bureau are achieved through such activities as:—

1. Regular meetings of branches, usually at monthly intervals.
2. Addresses and demonstrations by officers of the Department of Agriculture and other institutions, by members of the Bureau and other associations.
3. Discussion groups.
4. "Question Box" service.
5. Film evenings.
6. Play production and play-readings.
7. Debates.
8. Experiment and demonstration plots.
9. Field days, field trials of machinery and field competitions.
10. Exhibits at shows, and co-operation with local agricultural societies.
11. Library.
12. Social gatherings.
13. Co-operative development of community facilities.
14. Fostering Junior Farmers' Clubs.
15. Youth camps and schools—to develop citizenship qualities.
16. Divisional conferences.
17. Annual State conference at Hawkesbury Agricultural College, for a three-day programme of educational sessions.

These activities are dealt with in more detail in another publication.

How to Form a Branch.

A branch is simply formed. The procedure is briefly as follows:—

1. Form an organising committee of three or four interested people. It may even be a special-purpose sub-committee set up by the local branch of another association of primary producers. Appoint an acting secretary of this committee. The functions of this committee are—

(*a*) To fix a date for and convene a public meeting.

(*b*) To canvass the locality for an attendance at the public meeting.

(*c*) To obtain a supply of Agricultural Bureau pamphlets from the Under Secretary, Department of Agriculture, Box 36A, G.P.O., Sydney.

(*d*) To invite the Department of Agriculture to send a representative to the public, inaugural meeting. Attendance of a representative is desirable, though not necessary and not always possible.

2. After the objects of the Agricultural Bureau have been explained to the public meeting, the Acting Chairman should proceed with the following business:—

(*a*) Ask for a formal motion to be moved and seconded: "This meeting desires the formation of a branch of the Agricultural

(*Continued on page 471.*)

Training for Rural Life.

Successful Agricultural Bureau Youth School at Bribbaree.

A SUCCESSFUL rural youth school, organised by the Bribbaree branch of the Agricultural Bureau in co-operation with the Division of Information and Extension Services and other Divisions of the Department of Agriculture, was held at Bribbaree on 5th to 15th August.

At the conclusion of the school, Mr. H. Parry Brown, Organiser of the Bureau, said: "In no field do we feel that we can do better work than in that of rural youth, and Bribbaree camp was one of a series organised recently. As in the case of other schools, the accent was not exclusively on farming—the essential aim was a brief educational course in the elements of good rural 'citizenship.' The Bureau objective is 'better farming, better business, and better living,' to make accessible to farming people the maximum of helpful information. There are many Government and other institutions which offer them valuable service, but the essential local contact is often missing. By the development of leaders at these youth schools we hope to close that gap."

Mr. P. F. Stanton, District Agricultural Instructor, Young, was officer in charge of the school, and a strong committee of Bureau members had worked hard for several weeks converting the buildings on the local showground into a model camp for the housing of the boys. A large pavilion provided sleeping accommodation for twenty-five boys and young men of ages varying between 15 and 25 years. Another

Members of the Bribbaree Youth School.
The pavilions of the local showground provided excellent sleeping, lecture and messing facilities.
[Photo by R. D. Meaker.

our view being that there is need for instruction not only in the science of farming but also in the art of rural life. Happy farming communities, we believe, are those which, by the mobilisation of goodwill and mutual interest and with the aid of the necessary education, have discovered their potentialities. Education in farming technique is a primary part of our work, but it is by no means the whole of it. Our overall aim is

pavilion was used for meals and lectures, while a well-equipped kitchen, in charge of Messrs. Hugh Carroll and Frank Harvey, turned out—in quality, quantity and variety —a first-class fare.

The Syllabus.

The syllabus of the school included talks and discussions on citizenship, public speaking, leadership, chairmanship, personality,

press reports of rural activities, home planning, how to conduct discussions, and how to conduct banquets and other social gatherings, also play-readings. Demonstrations were given on farm carpentering, blacksmithing, engine and tractor repairs, the use of bush-fire equipment, wool and flock classing, rope work, and pruning and grafting.

P. Coelli (Caragabal), T. C. West and A. Aston.

The boys were appreciative of the work of the Bribbaree branch, which, under the presidency of Mr. L. R. Cullen, assisted by the secretary, Mr. Lester Holland, and a special committee of Messrs. H. J. Moran,

Among the Demonstrations Given at the School was the Use of Bush Fire Fighting Equipment.

The boys were given practical experience in the use of these implements.

Features of the Camp were the Arrangements for First-class Meals.

The boys are shown arriving for a meal.

[*Photos by R. D. Meaker.*

During the school the chair for various sessions was taken by members of the camp, in turn, while every boy was expected to prepare and deliver at least two speeches for criticism by tutors and members of the school. Marked progress was evident in these fields between speeches. Discussions were conducted by the boys on such subjects as "Erosion is a Farmer's Problem," "Does Fodder Conservation Pay?" "Research and Practice," and "Progeny Testing."

Local lecturers and demonstrators included Messrs. D. Duncan, L. R. Cullen, E. Jarratt, G. Longhurst, had installed electric light, a large kitchen range, and bathing facilities and generally provided for their comfort. The branch also made it possible for sport and physical culture to be included in the school.

Not the least interesting feature of the school was the day-to-day attendance of visiting men and women from other localities and other organisations, including members of the State Parliament. Their praise of the camp and its objectives was uniformly high.

CONTROL OF *Thrips tabaci* ON ONIONS.

Experiments with D.D.T. and Tartar Emetic.

P. C. HELY, B.Sc.Agr., Entomologist.

THE onion thrips (*Thrips tabaci* Lind.) is, according to Bailey[1], probably the most widely distributed thrips in the world, and is found wherever onions grow. Not only does it infest onions and related plants, but it is recorded from a very wide range of host plants, many of which are, however, incidental, and on which little reproduction takes place.

In this State, in addition to onions, these thrips may cause economic injury to such crops as tobacco, cabbage, peas, beans, cucurbits, potatoes, etc. Probably its best known role, however, is that of the vector of the virus disease known as bronze or spotted wilt of tomatoes.

The adult thrips is a small insect about 1/25 inch long, and varies in colour from light to dark brown and is equipped with two pairs of greyish wings, fringed around the margins with fine hairs.

The larvae are cream to yellow-coloured, wingless insects, and on onions are found mostly clustered in groups at the base of the central leaves in the "throat" or "chit" of the plant, where they graze on the very tender tissues of the leaf surfaces. The adults are also found in this situation where they deposit their eggs, but the main feeding sites are on the upper, exposed surfaces of the leaves.

Thrips injury on onions is to be seen on almost any bed of onions examined, and takes the form of "silvering," or "blasting" of the foliage. This "silvered" effect is brought about by the coalescence of the whitish patches, due to the sucking out of the cell contents, which characterise the feeding sites of the small colonies of thrips.

Where gross feeding occurs, the leaves also tend to become buckled and twisted and die back from the tips, and the plants may become dwarfed, or even killed out. Whilst reported quantitative estimates of injury to onion crops due to thrips in California have ranged as high as 33-50 per cent. of the onion crop in some regions [2], no such information appears to be available here, and onion thrips have been regarded almost as a necessary adjunct to the onion plant. Indeed, many people regard the "silvering" effect produced by thrips as a natural feature involved in the ripening process of the bulb.

Recent Trends in Control Measures.

Whilst onion thrips are easily killed by various contact insecticides, satisfactory control is, nevertheless, difficult owing to the fact that the young thrips are so well protected in the "chits" of the plants, and that reproduction and development proceed at such a very rapid rate.

Bailey, in 1938, referred to promising developments in the use of naphthalene-hydrated lime dust, or an emulsion of napthalene in carbon disulphide applied as a spray, and stated that the possibility of developing a thrips resistant onion by cross-breeding and selection was also promising.

During the spring of 1937, the writer devoted some time to the problem of thrips control on onions, but results were unsatisfactory with the materials tested, which included nicotine in spray or dust form, derris, naphthalene and pyrethrum. Fair kills of thrips were obtained with nicotine dusts used under "dusting tunnels" which confined the dust in the vicinity of the plants for some time, but reinfestation and build-up of thrips populations were rapid and no worthwhile results were obtained.

Most recent developments in thrips control generally have centred around the use of poison bait sprays, and these have given spectacular results in the case of citrus thrips control in California, and for the control of gladiolus thrips by the use of tartar emetic-sugar bait sprays. Experiments for the control of spotted wilt on tomatoes [3] indicated that the incidence of this disease was reduced where tartar-emetic bait sprays were used, and inferentially that control of the thrips vector was demonstrated.

A Control Experiment in 1945-46.

When an opportunity presented itself last season it was decided to set out an ex-

periment with a view to determining, if possible:—

(*a*) The amount of injury caused to an onion crop by *Thrips tabaci* and to estimate the possibilities of control in relation to yield.

(*b*) To test the value of tartar emetic as a bait spray.

(*c*) To explore the possibilities of D.D.T., which had recently become available, in spray and dust form.

All of these objectives were substantially achieved.

The Procedure Adopted.

Seedling onions, 9 inches long, after having the tops and roots shortened, were planted out on 2nd August, 1945, at Somersby in 36 yard long beds of 4 rows each. White and brown varieties were planted in alternate beds, the varieties used being Early Flat White and Long Keeping Brown Spanish, but one bed of Maitland White and one of Golden Emperor were also included.

Prior to planting out, half the plants were dipped in an emulsion containing 0.1 per cent. D.D.T., and the others were not dipped. In setting out these plants, paired beds of Brown and White dipped seedlings alternated with similar paired beds of undipped plants. At the time of transplanting very occasional thrips were seen in the "chits" of the seedlings.

The beds were then marked off in 9-yard sections, and in each bed three treatments and one check plot were randomised. This allowed of six replications of treatments and checks in each variety, giving a total of twelve plots of each. The experimental plots were distributed equally among both dipped and undipped plants of each variety.

The first sprays and dusts were applied on 3rd October, and subsequent applications were made on 12th, 19th and 29th October and on 12th November, and a further application was made on brown onions only on 27th November, making a total of five applications on the white and six on the brown onions.

At the commencement of treatment the undipped plants showed signs of thrips mottling and some buckling of the leaves and large numbers of larvae in the "chits." Dipped plants also showed plenty of thrips in the "chits", but leaf infestation was not quite so marked as in the undipped plots. At this time the plants were 12 inches to 15 inches high and were growing well. A little mildew was evident and sulphur dusts were applied over the whole area occasionally as was thought necessary.

The following treatments were tested:—

A.—D.D.T.—solvent naphtha emulsion at 0.1 per cent. D.D.T.

B.—1 per cent. D.D.T.—pyrophyllite dust.

C.—Tartar emetic 1 oz., sugar 4 ozs., water 4 gallons.

D.—Untreated checks.

The tartar emetic bait sprays were applied as a fine mist over the plants at the rate of approximately 48 gallons per acre, whilst the D.D.T. emulsion was put on more heavily and directly over the plants at the rate of about 96 gallons per acre. The dust was applied at the rate of about 32 lb. per acre.

Observations Made.

Differences in the thrips populations and also in the appearance of the plants became evident some nine days after the first application. Treated plants showed some reduction in thrips numbers as compared with untreated plants, but those sprayed with D.D.T. emulsion were outstanding. In early November, after four treatments had been given, very striking differences were to be seen in both thrips numbers and plant development. Plants sprayed with D.D.T. were probably twice the height of the check plants, and were green and succulent and almost completely free of mottling and buckling of the leaves. Check plants, on the other hand, were stunted, grey mottled, and showed a good deal of leaf twisting and withering back from the tips. Intermediate in height and appearance were the dusted plants, whilst those sprayed with tartar emetic were somewhat better than the checks, but not so good as the dusted plants.

On 23rd November, eleven days after the fourth treatment had been applied, a thrips count was made on five plants selected at random amongst the central two rows in

each plot of brown onions. With the aid of magnifying spectacles, the total number of adult and larval thrips on the inside surface of the left hand fully developed centre leaf on each of these selected plants was counted. This included both the larval populations in the "throats" and the adults feeding on the exposed surfaces. The mean number of thrips per leaf on untreated plants was 40.5, but individual counts ranged up to 90. On the tartar emetic-sprayed plants the figure was 37.6, and on the dusted plants, 27.8, whilst those sprayed with D.D.T. emulsion showed only 1.9 thrips per leaf. It was noted also that the few thrips which did occur on the D.D.T.-sprayed plants were all adults on the tops of the plants, whereas large numbers of larval thrips were present on the other plots.

Effect of Treatments on Weight of Bulbs.

Harvesting of white onions was done on 27th November, when the tops of the plants in the check plots were withered and shrivelled; at this time the foliage of the sprayed plants had commenced to bend over, but was still green and succulent. In order to maintain uniformity, all plots were pulled at the same time and the bulbs of the centre two rows in each plot were counted and weighed.

The brown onions were not harvested until 18th January, 1946, when the tops of the untreated plants were completely dried and shrivelled and the sprayed plants were about half withered. Counts and weights were taken as in the case of the white onions.

These results are set out in the following table:—

Whilst the statistical analysis shows the differences between the spraying and dusting treatments to be non-significant in the case of the white onions, it is thought that the probable reason lies in the fact that the treated onions were pulled before they had attained their full weight and were still growing, whilst the untreated onions were fully mature. The striking difference in the appearance of the plants in the different plots, plus the fact that the treatment differences were significant in the case of the brown onions (the differences in the white onion yields following a very similar trend), is advanced in support of this view. The outstanding feature of the results is the decided increase in yield where plants were sprayed with D.D.T. emulsion as compared with untreated plants. Tartar emetic was of little value but D.D.T. dust showed some promise and warrants trial at a higher concentration.

The Economic Aspect.

The calculations given below are based on the actual conditions and results of the experimental work described herein, and also on the actual market returns obtained by the grower from consignments of mixed onions from the plots. No account is taken of the fact that the yield from the sprayed plots of white onions would almost certainly have been heavier had the bulbs been left in the ground until fully ready to harvest. Also, under ordinary crop conditions, spraying of the whole area would have eliminated, or greatly reduced, the thrips populations over the whole area instead of having a large number of heavily infested reinfestation centres immediately adjacent to the sprayed plots.

Treatment.	Mean Weight Per Bulb.		Mean Number of Thrips Per Leaf.
	White.	Brown.	Brown Onions.
	Oz.	Oz.	
Dipped	6.45	3.52	27.0
Not dipped	4.30	3.46	26.0
Difference necessary for significance	0.94	......	......
A.—0.1 per cent D.D.T. spray	6.00	4.05	1.9
B.—1 per cent D.D.T. dust	5.48	3.52	27.8
C.—Tartar emetic-sugar	5.30	2.94	37.6
D.—Untreated	4.73	2.57	40.5
Difference necessary for significance	......	0.60	......

In short, the figures may fairly be claimed to represent maximum costs and minimum yields for the particular crop this season. It may be stated, however, that thrips infestation last spring was probably unusually heavy, and in seasons of lighter infestation the improvement in yield due to spraying may not be so spectacular.

Comparison of Nett Returns from D.D.T.—Sprayed and Untreated Plots.

	Yield.	Price per Ton.	Gross Return.	No. of Sprays.	Cost of Material.	Nett Return.	Increased Return per Acre due to Spray.
	Tons per acre.	£	£ s. d.		£ s. d.	£ s. d.	£ s. d.
White Onions—							
Unsprayed ...	8·45	14	118 6 0	nil	......	118 6 0	......
Sprayed ...	10·9		152 12 0	5	6 2 6	146 9 6	28 3 6
Brown Onions—							
Unsprayed ...	4·6	23	105 16 0	nil	......	105 16 0	......
Sprayed ...	8·4		193 4 0	6	7 7 0	185 17 0	80 1 0

The above costs are based on the use of 100 gallons of 0.1 per cent. D.D.T. spray per acre per application. Emulsions containing 20 per cent. D.D.T. are available at present at £2 9s. per gallon; thus 100 gallons of spray as used in this trial would cost £1 4s. 6d.

No estimate of the cost of application of the spray is given, as this would depend upon the method of application. In the experiment reviewed, spraying was done with a knapsack spray pump, but for commercial use, a power spray outfit fitted with a multiple nozzle horizontal boom would be ideally suited. Long lengths of ¼-inch spray hose, attached to a power- or hand-operated barrel spray pump would also be quite satisfactory.

Dipping Plants Prior to Setting Out.

An analysis of the mean weights of bulbs from dipped and undipped plants showed an advantage in favour of dipping in both the brown and white onion varieties. However, the difference was significant only in the case of the white onions, where it represented an increase of approximately 2 tons per acre in favour of the dipped plants.

The cost and trouble of dipping onion plants in a 0.1 per cent. solution of D.D.T. prior to planting is very small, as the plants are, in any case, bundled for top and root pruning and require to be plunged only for a few seconds into the dip solution.

Summary.

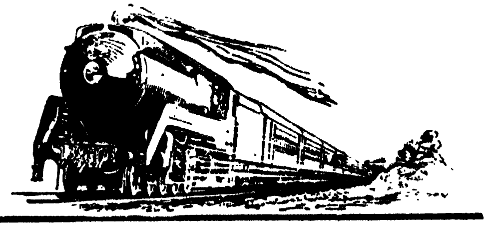
1.—Some notes on the incidence, type of injury and distribution of the onion thrips (*Thrips tabaci*) are given, and a comparative experiment designed to test the value of D.D.T. in spray and dust form, and tartar emetic as a bait spray against this thrips on onions is described.

2.—An increase in yield over the untreated plants is shown with all treatments, but D.D.T. in spray form at 0.1 per cent. concentration was outstanding.

3.—Yield increases from 26.8 per cent. in white onions, to 75 per cent. in brown onions, were shown to be due to controlling thrips with D.D.T. emulsion. These increases represented a difference of 2.45 to 3.8 tons of onions per acre, and the value of these increases at prevailing market rates represented a nett return, after deducting cost of material, of from £28 3s. 6d. to £80 1s. per acre.

4.—The percentage increases in yield due to D.D.T. spray as compared with 1 per cent. D.D.T. dust treatment were 11.1 and 40.6 per cent., and compared with tartar emetic bait spray, 12.9 and 68.3 per cent., for white and brown onions respectively.

5.—Actual thrips counts during the course of the experiment on brown onions showed a marked decrease in the numbers on D.D.T.-sprayed plants, there being twenty times as many thrips per plant on the untreated, nineteen times as many on the tartar emetic-sprayed plants and fifteen times as many on the plants dusted with D.D.T.



An Appreciation

*

In recent months the Department of Railways has been forced to make successive reductions in its train services owing to the shortage of coal.

During the latter part of June electric train services in the Metropolitan Area were reduced to hourly timetables in off-peak periods and steam trains to tourist areas were withdrawn. At the end of June the reservation of sleeping berths was discontinued, the reservation of seats was restricted, and country train services were reduced by 50 per cent. Early in July facilities for goods traffic were rationed by 10 per cent., and before the end of that month it was necessary to ration goods traffic by a further 25 per cent.

All of these unavoidable train service reductions have had adverse effects. Passengers and consignors have been greatly inconvenienced, and the repercussions have been felt by the whole community.

Despite it all the Department has experienced considerable co-operation on the part of the public. In proportion to the inconvenience caused there has been a remarkable absence of criticism. Apparently it is recognised that railwaymen are doing the best that can be done in an extemely difficult situation.

For that co-operation the Department is exceedingly grateful and wishes to express its appreciation. Train users may be assured that their confidence in the Railways is not misplaced, and that the least possible inconvenience will be caused until normal services can be restored.

S. R. NICHOLAS,
Secretary for Railways.

6.—Dipping the plants prior to planting in a 0.1 per cent. emulsion of D.D.T. appeared to be of value and was shown to give a significant improvement in yield in the case of the white onions.

7.—The experiment appears to be the first quantitative measurement of the effect of *Thrips tabaci* on onion yields in this country.

Acknowledgment.

The enthusiastic interest and practical assistance rendered by Messrs. A. R. and D. Studds, "Allambi," Somersby, was in large measure responsible for the successful conduct of the experiment described.

Thanks are also tendered to Mr. F. C. McCleery, Biometrician of the Department of Agriculture, for the statistical analysis of the results.

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[1]—BAILEY, S. F.—Calif. Agr. Exp. Stn. Cir. 346. 1938.

[2]—MACKIE, D. B.—*Mon. Bull. Dept. Agric. Calif.* XXI: 12: 474-488. 1932.

[3]—MAGEE, C. J., MORGAN, W. L., JOHNSTON, A. N.—*Jour. Aust. Inst. Agr. Sc.* 8. 115-17. 1942.

The Agricultural Bureau—*continued from page* 464.

Bureau to be called the (name of locality) branch of the Agricultural Bureau of New South Wales."

(*b*) If the motion is carried, then adopt a Branch Constitution. The pamphlet supplied by the Department of Agriculture contains a simple, draft, Branch Constitution.

(*c*) Decide the membership fees for full and associate members.

(*d*) Enrol members. The total must be at least twenty. Associate members may be included to make up the twenty.

(*e*) Elect office-bearers—Chairman, Vice-Chairman, Hon. Secretary and Hon. Treasurer, or whatever officers are required by the adopted Constitution, for the remainder of the first annual term.

Confirmation of the Branch.

Immediately after the inaugural meeting the Hon. Secretary should apply to the Under Secretary and Director, Department of Agriculture, Sydney, for "Registration of the Branch." In this formal application the Hon. Secretary must supply the following information:—

(*a*) Proposed name of branch.

(*b*) Geographical position, *i.e.*, distance from rail station or other transport.

(*c*) Number of members (not less than twenty, including associates). List the names, addresses and occupations on a separate sheet.

(*d*) Subscription rates—full and associate.

(*e*) Names of office-bearers.

(*f*) Regular meeting day, *e.g.*, "on (particular week day or night) of (particular week) in each month."

(*g*) Date of inaugural meeting.

The Need for the Bureau.

Some organisation is necessary to take best advantage of the services of the Department of Agriculture and other institutions. Veterinary Officers, Sheep and Wool Instructors, Agricultural Instructors, Dairy Instructors, Fruit Instructors and officers of the Women's Extension Service collectively do meet a few thousand rural people annually, but can greatly increase their contacts where farmers provide an organisation whereby groups may meet for lectures, discussions, experiments, demonstrations and local agricultural planning.

This is the service that the Agricultural Bureau can give. It will give it more and more efficiently as more rural people, in more localities, appreciate the opportunities offered.

Better Pastures to Improve Lamb Quality.

Value of New Zealand Seed.

DISCUSSING the results of his talks with the New Zealand Government during his recent visit to the Dominion in connection with the development of reciprocal trade in primary produce, the Minister for Agriculture, Mr. Graham, referred to the post-war need for pasture improvement and to the importance of quality and uniformity in the Australian export lamb.

"I am hopeful," said Mr. Graham, "that it will now be possible for New Zealand to supply practically all the pasture seeds that Australia requires from their growers. New Zealand pasture seeds suit our higher rainfall areas admirably, and New South Wales in particular has always been a big buyer. With new closer settlement areas, and with the resowing of large areas of pastures that have deteriorated during the war owing to superphosphate shortages, New South Wales will require even greater quantities in the future than has been the case in past years, so that it will be of the greatest benefit to this State to be able to secure its requirements of the high quality seed that is produced in New Zealand."

High Standard of New Zealand Grasslands.

Mr. Graham said he was greatly impressed with the work being carried out in New Zealand in maintaining their pastures at a high standard of efficiency. The basis of all their stock production was grassland farming, and the New Zealand Government had set up a highly efficient organisation to help the farmers in this direction. The Grasslands Division of the Department of Scientific and Industrial Research was continually striving to produce improved strains of the types of pasture plants best suited to their particular conditions. This Division was splendidly equipped with plant breeding and laboratory facilities, together with all the facilities necessary for testing the value of the strains evolved on the research stations. When these strains were put into commercial production the Department of Agriculture had a very efficient system of seed certification which ensured that buyers received seed true to type and quality.

Although many of the pastures throughout the Dominion were still capable of quite a lot of improvement, in accordance with the latest developments, the general grasslands standard was high. With the abundant rainfall that prevailed in so many of their districts, and with careful management of the pastures, it was possible for the New Zealand farmer to take off his farm each year very big numbers of sheep and lambs without overstocking his property.

Excellent Fat Lambs Produced.

By concentrating on the Romney Marsh and Romney cross ewe mated with the Southdown ram and other recognised sires, it had been possible for them to product a type of fat lamb that found great favour on the world markets, both for its high quality and for the uniformity of its carcase.

"We in Australia must concentrate more carefully on the production of uniform type and quality in our lambs for the export market," said the Minister. "Even prior to my visit to New Zealand, I have been convinced of this, and I am now even more of that opinion, and it is my intention as soon as possible to have a Departmental officer specially detailed to concentrate on this work so that we will be in a better position to compete on the world's markets at the expiration of our meat contract with Britain."

Varieties of Approved Seed Available.

IN order that farmers may be directed to what are regarded by the Department as the most satisfactory local sources of approved seed of recommended commercial varieties of farm crops and vegetables, the Department is willing to supply information concerning such sources of seed of the following varieties:—

Tomatoes—

Rouge de Marmande.

Factors Influencing Successful Storage of the Wheat Harvest.

(*Continued from page* 460.)

grain temporarily on his property, particular attention should be given to the method of stacking. A site which has not previously been used for the storage of grain should be selected, and the bags should be placed on clean dunnage (preferably covered with flooring boards) so as to prevent direct contact with the ground. The top of the stack should be protected from adverse weather by a properly constructed roof, and the sides by hessian, placed at least 18 inches to 2 feet away from the stack.

FRUITGROWING

The Beurre Bosc Pear.

A Harvesting and Marketing Programme

To Ensure Maximum Quality.

E. C. WHITTAKER, Fruit Instructor.

THE Beurre Bosc pear is a vigorous tree, easy to handle, and produces heavy and consistent crops of good-sized fruit. The variety is one of the best for dessert and is reliable under cool storage conditions. Unfortunately, however, under the present methods of handling, the Beurre Bosc has a poor reputation on the local markets, since it reaches the consumer in a very unsatisfactory condition.

An investigation of the ripening processes of this pear after harvesting was carried out in the Orange district for the past four years, and a harvesting, storing and marketing programme has been worked out which will enable the fruit of this useful variety to be delivered to the consumer in a satisfactory firm-ripe dessert condition.

The Buerre Bosc pear is held in high regard in the United States of America where it is one of the leading varieties, but special care is taken in regard to the ripening of the fruit.

Unfortunately in this State the Bosc has so receded in public favour that it is now regarded by most growers as a second-rate variety, and as such hundreds of trees have —during the past few years—been reworked to other and better paying sorts. It has a reputation amongst retailers for shrivelling, blackening, "leatheriness," lack of flavour and the early development of core rot and other disorders which in the aggregate combine to make it an unpopular variety on the markets. This state of affairs has mainly come about owing to the fact that the Beurre Bosc has—under existing conditions of handling—proved to be a very unreliable variety to ripen.

A Good Dessert Variety.

Nevertheless the fact remains that the Beurre Bosc is one of the finest dessert pears grown when properly handled, and from a growers' point of view it should be also one of the most profitable, as the tree is vigorous, easy to manage in the way of pruning, etc., and is a heavy and constant producer of good sized fruit.

Also it fills a very useful place in the marketing of pears ex cool store. It is a reliable cool storage variety, and having a longer storage life than Williams Bon Chretien it can very usefully be employed to bridge the gap between that variety and Packham's—especially in those districts where the Winter Cole cannot be grown to perfection.

The Investigations at Orange.

Because of all these good points, it is apparent that any extra care and attention to harvesting and marketing necessary to ensure that Beurre Bosc pears reach the consumer in firm dessert condition, would be well warranted. Hence it was decided to endeavour to gain accurate knowledge of the ripening of this pear during the marketing period following harvesting at various stages of maturity—it was thought that a good deal of the trouble experienced with the ripening was due to immaturity at harvesting. A series of trials was inaugurated in 1943 in the Orange district, and the results obtained have been so consistent during the four years that certain recommendations concerning the picking and handling of this pear can now be made.

The Harvesting Dates.

As the investigation was mainly concerned with harvesting maturity, the experiment was planned so that picking commenced approximately when the first of the Beurre

Bosc crop was coming into the cool stores from private growers—this usually occurred about the beginning of the last week in February. Subsequently successive pickings were taken at weekly intervals until the third week of March, thus giving a sequence of five pickings. The following 1946 dates will give an indication of how the various pickings were arranged.

1st picking	18/2/46.	
2nd picking	25/2/46.	
3rd picking	4/3/46.	(N.A A. 0.001 per cent. applied).
4th picking	11/3/46.	
5th picking	18/3/46.	

In the ordinary course of events, the bulk of the Beurre Bosc crop would be picked by the time of the third picking for these tests, as usually by this time the risk of serious loss by pre-harvest "drop" becomes imminent, and most growers endeavour to pick in time to avoid such loss if possible. It would appear to be uneconomical to postpone picking later than this particular period, but the advent of N.A.A. and other hormone sprays has radically altered the position so far as this "drop" is concerned.

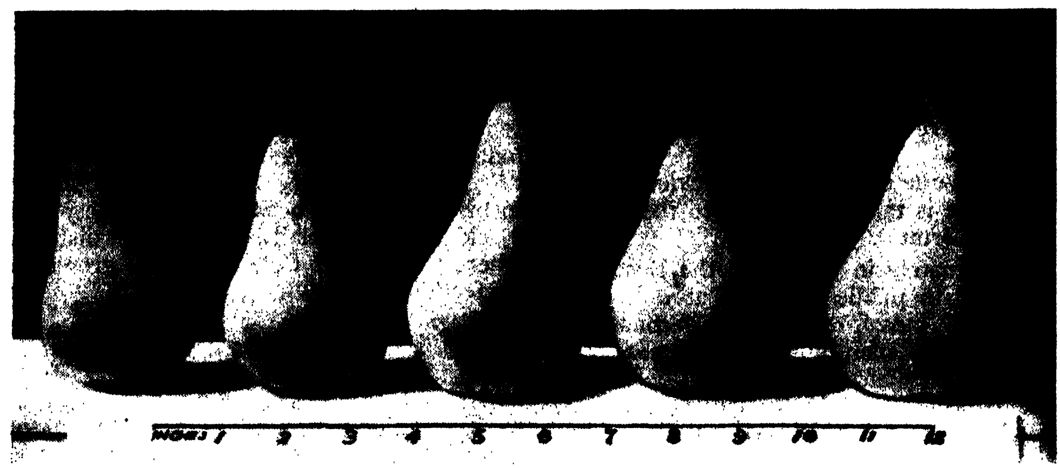
Cool Storage Conditions.

During the first two seasons all the fruit was held in store until early June, thus giving a cool store period varying from approximately eleven weeks in the case of the first picking to seven weeks or thereabouts with the last. In the 1945 and 1946 series, however, the fruit was divided into two sections—one lot of each picking being removed from cool store after eight weeks storage and the other being left in store as usual until early June. In general, the results were the same for both periods.

Results in Common Storage.

In addition, during the past four seasons fruit from each picking has been held and ripened in common storage. The results indicated definitely the Beurre Bosc pears picked prior to the third period referred to above could not be relied on to ripen up to a commercially attractive article—as a rule, ripening was very uneven and slow, dessert quality extremely poor and appearance such as to make them commercially useless.

The third, fourth and fifth pickings reacted better to common storage conditions.



Beurre Bosc Pears of Various Pickings Compared.
Left to Right.—Average fruits of first to fifth pickings respectively.

Ripening, by comparison to the early picking, was reasonably even, and flavour and appearance good and fair respectively—the main trouble being a fair amount of shrivelling.

It would appear then that if, in normal marketing operations, Beurre Bosc pears are to be put on the market direct from the tree, then the need for delaying picking until the fruit is well matured is of paramount importance.

Cool Storage Results.

With cool stored fruit right through the series there was a marked superiority in all respects of fruit from the third, fourth and fifth pickings.

Generally speaking, although the fruit from the two early pickings ex cool store ripened fairly well, it was not nearly as attractive a sample as the later pickings in appearance or in dessert quality.

The later-picked fruit ripened to a more attractive colour and was of excellent dessert quality, whilst contrary to expectation core rot did not develop very much before it became apparent in the early-picked fruit. As a matter of fact, right through the series core rot was of little importance in respect to the fruit ex cool store. Usually no rot was apparent until well after the soft ripe stage, by which time in the ordinary course of events the fruit would have been consumed.

Ex-Storage Ripening.

The time taken to ripen after removal from cool store is of the greatest importance in marketing. Irrespective of the picking period, it took usually five to seven days for the fruit to reach the firm ripe stage and ten to twelve days to the soft ripe stage—followed by another period of from five to seven days before the fruit became too ripe for consumption.

It can be taken, therefore, that there is a period of at least a fortnight after removal from cool store during which the fruit can be marketed and consumed in first class condition.

It should be noted that after a period of from two to three months in cool store practically no difference was noted in the time of ripening between the early- and late-picked fruit, but under common storage conditions there was considerable difference in time as well as palatability of the ultimate product.

The contrast in appearance of the early and late pickings of fruit immediately after removal from cool store has an important bearing on market value. It can be taken that in the ordinary course of events fruit ex cool store would reach the markets within a day or two, hence appearance is of considerable value, and in this respect again the late-picked fruit shows up to considerable advantage.

Usually the fruit from the early pickings is either very variable in colour or consistently dull and green with usually a fair amount of shrivelling around the stem end. On the other hand fruit from the third, fourth and fifth pickings was of even colour, bright and attractive in general appearance with usually no shrivelling, or at the most very slight shrivelling around the stalk.

On appearance alone this late-picked fruit should be worth shillings per case more on the market, than early-picked fruit.

The Effect of Time of Picking on Fruit Size.

Another factor of utmost importance was the influence on size of later picking. This was consistent throughout the series. The following figures show the average sizes for each picking taken during the four-year series:—

Picking.	1943.	1944.	1945.	1946.
	Inches.	Inches.	Inches.	Inches.
1	$2\frac{1}{2}$	$2\frac{1}{8} - 2\frac{1}{4}$	$2\frac{1}{2}$ $2\frac{5}{8}$	$2\frac{1}{2} - 2\frac{5}{8}$
2	$2\frac{1}{2} - 2\frac{5}{8}$	$2\frac{1}{4} - 2\frac{3}{8}$	$2\frac{5}{8}$ $2\frac{3}{4}$	$2\frac{5}{8} - 2\frac{3}{4}$
3	$2\frac{5}{8} - 2\frac{3}{4}$	$2\frac{3}{8} - 2\frac{1}{2}$	$2\frac{3}{4}$	$2\frac{3}{4} - 2\frac{7}{8}$
4	$2\frac{3}{4} - 3$	$2\frac{3}{8} - 2\frac{1}{2}$	$2\frac{3}{4} - 2\frac{7}{8}$	$3 - 3\frac{1}{8}$
5	$2\frac{7}{8} - 3$	$2\frac{1}{2} - 2\frac{3}{8}$	$2\frac{3}{4} - 2\frac{7}{8}$	$3 - 3\frac{1}{8}$

The figures given indicate a very substantial increase in the number of cases of fruit over the four week period between the first and fifth pickings. For instance in the year 1943 a crop of 100 cases of pears at the time of the first picking would have made up to approximately 140 to 150 cases if left on the trees until the period of the fifth picking. Again in, say 1945, which was a very dry season, the difference in size between the first and third pickings represents an increase in cases of something in the vicinity of 20 per cent.

It can be taken, therefore, that the increased size gained by later picking of this pear will more than compensate for the risk of losing a few fruits from pre-harvest drop, even apart from the fact that by the use of hormone sprays at the correct time such risk can be discounted almost entirely.

A Harvesting and Marketing Programme.

It seems obvious that to obtain the best possible marketing and dessert qualities with this particular pear, it should be allowed to reach a reasonably forward stage of maturity. Instead of harvesting being practically completed by the time of the third picking period in this experiment, as is usually the case at present, it should not commence until that time. Following the first picking an application of hormone spray

should be made to the trees, and subsequently another one or two pickings made —at intervals of five or six days—to complete the harvest.

The pears should be cool stored immediately after picking at a temperature of 31-32 deg. Fahr., and may be held for a period of up to 2 to 2½ months. There should be no delay in marketing the pears once they are removed from cool stores, and retailers should endeavour to dispose of them whilst still hard or, at worst, in a firm-ripe condition.

APPLE GROWING IN NEW SOUTH WALES.

H. BROADFOOT, Chief Fruit Instructor, and E. C. WHITTAKER, Fruit Instructor.

IN the first portion of this article, which appeared in the August issue, the authors emphasised the necessity of adopting soil fertility conserving methods in areas suited by soil and climate to apple growing if the industry is to be developed on sound lines, and described those districts.

In this issue they discuss suitable soils and sites and the preparations for planting.

Soils for Apple Growing.

The one-time popular belief that almost any kind of soil is good enough for apple growing is far from the truth, and there are many orchards—in fact whole districts—which to-day bear witness to the fallacy of such an idea.

Excellent quality fruit can, no doubt, be produced on poor soils, but in commercial fruitgrowing to-day, quality alone is not enough to ensure success, unless allied to quantity and consistency—and good and consistent crops cannot be expected from undersized and "staggy" trees.

In addition, physiological complaints and troubles arising from deficiencies of major and minor elements of plant nutrition are all more prevalent in apple plantings on poor, low grade soils.

An apple orchard, given good conditions, should last almost a lifetime. Hence if the trees are to be expected to grow and produce abundantly for such a period, the soil needs to be far from poor to begin with; in fact for best results it should be fertile, deep and well-drained.

The nature of the subsoil is of much importance, as with the increased use of seedling stocks it is imperative that a good medium be provided for their deep rooting characteristics, and furthermore any type of impervious subsoil frequently leads to waterlogging in wet periods or excessive drying out in droughts. A soil auger, properly used, is a very useful tool for a randomised survey over the whole area to be planted, and such a survey should always be a preliminary to preparation for planting.

Quite apart from actual fertility, shallow soils overlying heavy clay, ironstone gravel, or very sandy subsoils, have proved quite unsuited to commercial apple growing in many parts of the State.

Fig. 6.—Heavy and Consistent Crops Cannot Be Expected from Small and Staggy Trees growing in Poor Soil.


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Fig. 7.—An Apple Orchard, given Good Conditions, should Last Almost a Lifetime.

A block of Granny Smith apples in the Orange district, fifty years old.

In the three areas, viz., Orange, Batlow and Armidale-Uralla, mentioned earlier in this article, the prevailing soils are of either basaltic or granitic origin. They are for the most part rich, reddish-brown loams, well supplied with plant nutrients, and with a deep, friable, clayey subsoil. Granite soils, provided they are of good depth and the subsoil conditions are favourable, produce excellent quality apples, particularly of the long-keeping cool storage varieties.

The Oakdale district provides a good example of an area well adapted to the growing of early varieties for the local market. The soil in this area is derived from Wianamatta shale.

Suitable Sites.

The selection of the actual site or location of an orchard after soil and other considerations mentioned previously have been dealt with, should be made with the objective of protection against frost, soil erosion and wind in view.

Spring frosts which may cause damage to the setting or to young fruit do occur in all our main apple areas, and for this reason the possibilities of the selected site from an "air drainage" point of view should be kept in mind.

Adequate air drainage is very often efficacious in minimising frost damage when

Fig. 8.—Apple Trees in their Sixth Year, Killed by *Armillaria mellea*.

They illustrate the folly of planting immediately after clearing.

there is a fair fall in the land below the orchard, the heavy cold air seeping slowly down to the lower levels, its place being taken on the higher ground by the warmer and lighter air. An unimpeded air flow to levels below the orchard site is probably the most effective and inexpensive method of minimising damage by frost. For this reason the site chosen should not be "pocketed" by heavy timber or topographical features.

Loss of soil by erosion is one of the most serious factors to consider. It has been mainly responsible for the premature decline of many orchards in the past, and in all future plantings measures to guard against loss of soil should be one of the first considerations. Unless the land is practically level it will be necessary to take steps to minimise erosion, and any land which cannot be adequately protected by such means —such as very steep slopes and broken hillsides—is unsuitable for this reason.

High winds at times cause considerable loss in fallen and blemished fruits, and also during the setting period; therefore, any natural topographical features which will aid in protecting the orchard from wind should be considered. The most efficient windbreak is a range of hills to the south and west of the chosen site. These give the necessary protection against the prevailing winds in most apple districts. A good belt of trees either native or planted, is also effective as a windbreak.

The direction of a slight slope is not of very great importance provided the site is adequately protected from the prevailing winds, but a slope to the east or north-east is preferable, if possible. The availability of a good water supply in close proximity to the site is a matter of importance, as such a facility plays a large part in the economic working of the orchard—particularly in regard to spraying.

Distance from rail and other facilities and conditions of transport to and from the orchard are also matters for consideration, as they are important in relation to production costs.

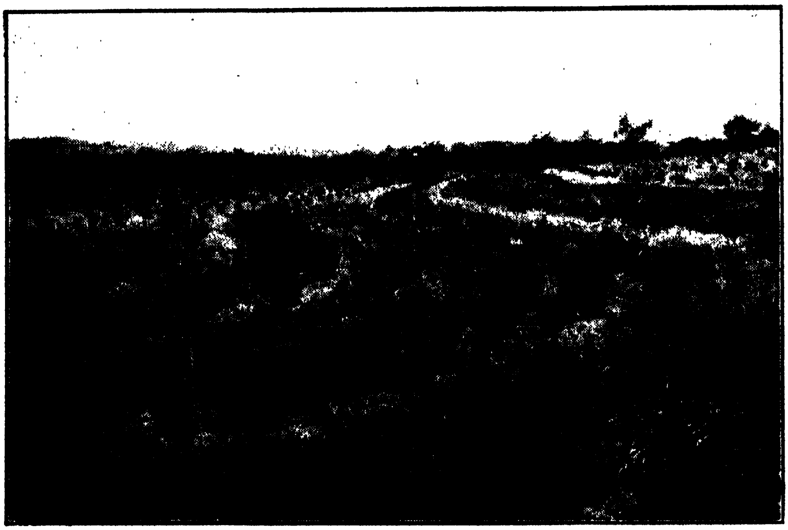


Fig. 9.—A Young Orchard Planted on the Contour.

Preparations for Planting.

Preparation for the planting of an orchard commences with the clearing of the land in most cases, and a word of warning is necessary in respect to the treatment of timbered country. In many areas the root-rot fungus (*Armillaria mellea*) is prevalent on the roots of native timber, and immediate planting of apple or other fruit trees after the removal of such trees, entails a serious risk of infecting them also with the fungus.

Deep ploughing and subsoiling, with the removal of all possible native tree roots to a depth of about 15 inches is recommended. In addition, in areas known to be badly infected with *Armillaria mellea,* it is sound practice to allow the newly broken ground to lie fallow for a season or two, or to crop it with shallow rooting and short season

vegetables for a short period prior to planting with trees. By these methods the risk of serious infection from the root-rot fungus is minimised, if not altogether eliminated.

So far as the actual laying out and planting are concerned, these matters are dealt with fully in a detailed and up-to-date Departmental publication, which may be had free on application to the Department, and therefore the subject will be only briefly dealt with here.

In cases where the site chosen is level or only slightly sloping, it is possible to control effectively any tendency to erode by adopting sound cultural methods, and on such areas the well-known square or triangle methods of planting will be found most satisfactory. However, much of the good apple growing land available consists of moderate to rather steep slopes, and on such land one of the first considerations should be the protection of the soil, to the greatest possible degree, from loss by erosion. It must be realised that the movement of soil down hill is a natural geological process and cannot altogether be prevented, but that this soil movement is greatly accelerated by soil tillage. It has proceeded at a disastrous rate on many square-planted orchards on sloping land. In some districts practically all orchards are affected to some extent by either gullying or sheet erosion of the surface soil—resulting in a marked decline in the health and production of trees which should be in their prime.

It is obvious that frequent cultivation of even moderate slopes leaves much to be desired, but as we have found it necessary to cultivate our orchards to some extent at least, it is fortunate that a practical solution of the erosion problem on such areas has been evolved in the method of contour planting.

Contour planting of orchards is not new so far as this State is concerned. Many acres of contoured orchards have been planted in the last decade or so, and as the menace of soil erosion is becoming better understood, it is confidently anticipated that the bulk of future plantings will be made on an erosion-prevention basis.

Another important factor to consider in contour planting is the fact that not only does it provide for conservation of the soil and plant nutrients, but since cultivation between the rows of trees is carried out on the contour, surplus rain water is run off at a greatly reduced speed, thus allowing more of it to soak in—an important item in periods of low rainfall.

As a practical guide to intending growers, any slope which is greater than say 3 per cent. (3 feet in 100 feet), is likely to be troublesome, unless contour planted. No great amount of technical skill is required to lay out an orchard site on the contour. Simple and practical methods have been devised to suit our conditions and are fully dealt with in the publication already mentioned. Furthermore, field officers of the Department of Agriculture are available and will render any assistance required.

(To be continued.)

Requirements in an Orchard Windbreak.

THE production of blossoms, fertilisation, and maturing of fruits cannot be satisfactorily carried out in situations open to the full force of high and frequent winds, and the planting of windbreaks might well be given greater consideration by many orchardists.

The most common fault with windbreaks is that they are too open for efficient protection, but an absolutely dense and impenetrable windbreak, apart from being difficult to attain, is also undesirable. The break should let a little wind go through. This slight movement of air through the break forms a cushion, both on the leeward and windward side, of more slowly moving air which deflects the main volume of wind upwards and prevents it from descending for some distance. On the other hand, if the break be impenetrable, the wind will describe a somersault over the obstacle, ascending violently on the windward side and dropping quickly and strongly on the leeward side, providing practically no shelter except in the immediate vicinity of the break. Further, complete stagnation of the air is undesirable from the point of view of fungous diseases and frost injury.—R. H. ANDERSON, Chief Botanist.

INSECT PESTS.

Notes contributed by the Entomological branch

Ants *(Formicidae)*.

AMONGST the commonest forms of ants which invade buildings, and feed upon various foodstuffs, are several species of small black ants (*Technomyrmex albipes, Tapinoma* sp., and *Iridomyrmex* sp.) **and two species of small brown ants** (*Monomorium pharaonis* and *Pheidole megacephala*).

The largest ants that at times enter dwellings, are the night-feeding sugar ants (*Camponotus nigriceps*).

Various species of ants often construct their nests in the vicinity of dwellings, and the one which frequently causes annoyance by forming its large nests in or near gravel paths, on tennis courts, and on other cleared spaces, is the active mound, or meat ant (*Iridomyrmex detectus*). **The different varieties of red or black bulldog or soldier ants** (*Myrmecia gulosa* and *Myrmecia* spp.) **also frequently construct their nests near dwellings. These bulldog ants possess very large jaws, and are also armed with well-developed stings with which they are able to inflict painful wounds.**

Other species of ants, at times, may cause damage to lawns and golf greens by raising small craters of earth around the entrances to their nests. A common species with this habit in northern coastal areas is a slender brown ant (*Aphaenogaster pythia*).

Ants are highly-developed social insects, in the nests of which three distinct castes or forms may be found. The castes consist of winged males, fertile females (queens) with wings which are lost after mating, and sterile females or workers without wings.

In some species, such as the large sugar ants and the small brown ant, there are specialised workers with large heads and jaws, known as soldiers. The workers, normally, have strong jaws and many species, such as the bulldog ants and green-head ants, are also provided with a powerful sting.

Life History.

The winged males and fertile females take their nuptial flight, in swarms, from the nests, at certain times of the year. A female or queen on descending to earth divests itself of its wings and seeks a place in which to found a new colony. It excavates a chamber or cell, within which it remains, and later deposits eggs. These eggs hatch into legless larvae, which are fed by the queen ant with secretions from its salivary glands, until, when fully-fed, they enter their pupal or chrysalis stage.

These pupae, later, change into workers which commence their various tasks in the work of the nest. They construct tunnels, forage for food, tend the queen ant and care for further eggs laid by it, feed the larvae, which are usually reared in clusters, or transport them from place to place in the nest as conditions may require, and defend the colony.

In some species the pupae are naked but others are enclosed within silken cocoons which are spun by the larvae.

The nests of most species of ants are made either in the ground, under logs or stones, under the bark of trees or in old stumps. Some live in cavities in trees and others, more rarely, in nests amongst the foliage of trees. When the small black ants or small brown ants infest buildings, they frequently construct their nests in cracks in the walls, under mantlepieces, behind skirting boards, or in other sheltered positions within the building.

The same colony of ants may have more than one nest, and the workers may be seen restlessly passing to and fro along regular

pathways for considerable distances, through grass, etc., from one nest to another. The nests may also be connected to one another by tunnels below ground.

CONTROL.

Small Black Ants and Sugar Ants.

Small black ants and the large sugar ants may be controlled by the use of poison baits. The formula for a bait which is recommended is as follows:—

Arsenite of soda (80 per cent. arsenious oxide) ..	1 part.
Honey	320 parts.
Water	20 parts.

A simple method of preparing the above bait is to dissolve 1 oz. of arsenite of soda in 1 pint of water, and then to take 1 fluid oz. of this poison solution and stir it thoroughly into 1 lb. of honey.

A small teaspoonful, or the quantity adhering to half a dozen wooden matches dipped into it, is the amount of bait suggested to be offered to any colony at one time. The amount of arsenic in a small teaspoonful of bait is approximately 1/16 grain. The advantages of using this bait are its relative simplicity in preparation, and its high honey content which prevents it from becoming mouldy and consequently losing its toxicity and attractiveness to the ants.

Another bait that may be used contains the following:—

Sugar	1 lb.
Borax	¼ oz.
Arsenite of soda (80 per cent. arsenious oxide)	1/16 oz.
Honey	1 oz.
Water	22 fluid oz.

To prepare this bait, boil the sugar and borax together, slowly, in 1 pint of water for 15 minutes and allow to cool. Dissolve the arsenite of soda in 2 fluid oz. of hot water, and when cool pour into the sugar-borax solution, stirring well Add the honey and mix thoroughly.

This bait may be set out in small tins (such as tobacco tins), the sides of which should be provided with openings for the entry of the ants, the lids being closed. A small piece of cloth or other substance placed within the tin will provide additional foothold for the ants. The baited tins are best placed in the tracks of the ants, preferably outside the house.

Large Brown Sugar Ants.

This group shows a winged female or queen, winged males, workers, soldiers and pupa cocoons. The soldier on the extreme left is carrying a young larva.

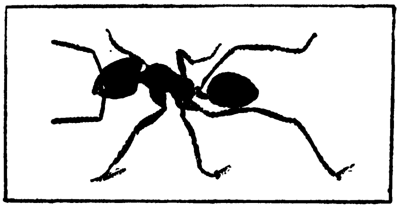
[After Hubbard and Strong.

Small Brown Ants.

A bait which is readily taken by the small brown ants, and also the small black and sugar ants, consists of the following:—

Sugar	1 lb.
Honey	3 oz.
Thallium sulphate ..	27 grains.
Water	1 pint.

To prepare this bait, place the sugar and thallium sulphate into the water, heat and stir thoroughly. Do not bring the mixture to the boil, and exercise care not to inhale the fumes given off during the process. Add the honey last, and mix thoroughly.



One of the Small Black Ants.

Ant baits are poisonous and care must be exercised in the use and handing of them. The containers should be labelled *"poison,"* and kept out of reach of children and irresponsible persons.

Mound or Meat Ants and Bulldog Ants.

Mound ants and bulldog ants may be controlled with carbon bisulphide, potassium cyanide or calcium cyanide dust. Both the potassium cyanide and calcium cyanide should be kept well out of the reach of irresponsible persons.

If carbon bisulphide is used, 1 or 2 oz. of this liquid should be poured down each main opening of the nest, the openings then being covered over with moist earth or wet bagging. The gas given off by this chemical, being heavier than air, penetrates downward into the galleries of the nest and kills the colony.

Carbon bisulphide is very inflammable and explosive, and lights of any kind must be kept well away from it at all times.

Where potassium cyanide is used, it is dissolved in water at the rate of 4 oz. to 1 gallon, and about a pint of the poisoned water is then poured down each opening to the nest. The openings to the nest should then be covered firmly with damp earth.

Cyanide water is an extremely deadly poison, as also are the fumes given off by it.

Calcium cyanide dust, which gives of hydrocyanic acid gas on exposure to the air, may be blown into the nest openings, in small quantities, by means of an insect-powder blower, and the openings then covered with damp earth.

The gas given off by calcium cyanide is extremely deadly.

The Use of D.D.T. to Control Ants.

In recent investigations on the control of ants with D.D.T.* it was found that a 5 per cent. D.D.T. dust, applied at the rate of 1 oz. to every four entrance holes, completely controlled the common mound or meat ants (*I. detectus*) within one week of treatment. A colony of these ants, treated with 2 quarts of a 0.1 per cent. D.D.T. solvent naphtha emulsion, was also completely controlled.

The treatments, however, did not prevent the re-population of the nest sites later, by connected or neighbouring colonies.

The Large Red Bulldog Ant.

A 5 per cent. D.D.T. dust, dusted into cupboards, and into a nest of small black house ants (*T. albipes*) was found to give complete control, and a 5 per cent. D.D.T. dust, dusted on floors and in shallow tins around the legs of a refrigerator was also found to be effective in controlling the small brown house ant (*P. megacephala*).

Where D.D.T. is used it should be kept away from foodstuffs.

* Helson, G. A. H. and Greaves, T., 1945. *C.S.I.R. Journ.* 18, No. 4.

D. D. T.

(dichloro—diphenyle—trichlorethane)

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STEM RUST OF WHEAT.

F. C. BUTLER, B.Sc.Agr., Assistant Plant Pathologist.

IN this article the author discusses the problem of the control of a disease, which, although spasmodic in occurrence, causes an estimated annual loss of a quarter of a million pounds to the wheatgrowers of New South Wales. Despite this, there is a general lack of recognition of the fact that it constitutes a major disease of wheat in this State.

The life history of the causal organism is indicated, the conditions necessary for the spread and persistence of the disease are described—particular mention being made of the significance of the common barberry and the need for eradication of this plant—and recommendations given for the control of rust.

Among the most important plant diseases from the economic standpoint are the various rusts which attack cereal crops such as wheat, oats and barley and native and cultivated grasses. Of the several distinct kinds of rust fungi capable of attacking cereals, the most important in New South Wales are those which cause the stem and leaf rusts of wheat. From the earliest days of colonisation, rust manifested itself as a serious menace to wheat production in this State, and the havoc it wrought in crops during the early years of last century stimulated exploration and was largely responsible for the development of wheat growing west of the Dividing Range.

Throughout the wheat belt proper, stem rust is of considerably more importance than leaf rust in reducing grain yield. In coastal areas, however, where wheat is grown for fodder purposes, leaf rust frequently causes much damage and impairs the quality of wheaten hay and chaff.

Stem rust is particularly serious when it develops on the upper portions of wheat stems during the grain-filling period and, in seasons when rust assumes epiphytotic proportions, considerable loss is incurred by the resultant decline in crop yield. Despite this, there is a general tendency to underestimate the damage caused by this disease. This lack of general recognition of rust as a major disease of wheat in New South Wales is undoubtedly attributable to the spasmodic occurrence of "rusty" seasons. Indeed, it is extremely fortunate for the wheat growers of this State that the disease does not annually develop to the serious extent it did, for example in 1916, when the estimated wheat losses from rust in New South Wales alone totalled £2,000,000.

Between 1918 and 1938 heavy losses resulted in four particular years—1920, 1925, 1930 and 1934—and over this twenty-year period, the average annual loss for the State has been computed at £250,000. Since 1938, there have been additional serious outbreaks, in the Riverina in 1939, and in the central

Fig. 1.—Stem Rust on Stems of the Susceptible Wheat Variety, Duri. Red Spore (Uredospore) Stage. Note the elongated rust pustules and ruptured stem surfaces.

and north-western districts in 1942, whilst there was considerable damage in the north-west again last season.

The occurrence of rust to a serious extent is closely related to climatic conditions—the environmental conditions must be suitable

Fig. 2.—A Bush of the Common Barberry.
Numerous shoots arise from below the surface of the ground.
[*From U.S. Farmers' Bull., No.* 1544.

for the pathogen, rust, to attack the host, the wheat plant. This serves to explain why rust damage is severe in a particular district one year and not the next, or why it is severe in one district and not another in any one particular season. Generally speaking, warm, muggy weather with frequent showers and heavy dews is particularly favourable to the development of rust. Consequently, the northern and north-western districts, under the influence of monsoonal rains in the summer months, are generally more liable to rust attack than the winter rainfall areas of the western and south-western districts.

Stem rust is also known as "Black," "Summer" or "Red" rust, and such are the annual losses occasioned by its attack throughout the wheatgrowing countries of the world, that it has probably received more attention than any other single disease.

The causal organism, *Puccinia graminis tritici*, is not confined in its attack to wheat alone, but is also capable of infecting barley and rye, and a number of grasses including Bearded Wheat grass (*Agropyron scabrum*), Barley grass (*Hordeum leporium*) and Rough Bearded grass (*Echinopogon ovata*). It does not attack oats—rust of oats is caused by *Puccinia graminis avenae*.

In this country, rust is present in the uredospore or red stage throughout the year on "volunteer" or self-sown wheat plants and on naturally occurring grasses in between the wheat-growing seasons. As might be expected, therefore, stem rust invariably appears first in the warmer and earlier wheat-growing districts of the State, such as the north-west.

The early appearance of rust does not necessarily indicate that the disease will assume epiphytotic proportions—the occurrence of a period of dry weather, unsuitable to its development, invariably acts as a check to further spread of the disease. There is another aspect, however. Even though subsequent weather conditions be such as to retard rust development in the area of initial outbreak, this area represents a source of potential danger in that rust inoculum may spread to other areas where climatic conditions are favourable for rust development. Consequently, the farmer who grows rust-resistant varieties not only safeguards himself from possible losses, but renders a service to the wheat-farming community in general by limiting, to some extent, the build-up of rust spore inoculum.

Symptoms.

Stem rust attacks all the above ground parts of the wheat plant, but is most destructive when the stems are infected. The first indication of rust attack is the appearance of somewhat elongated, reddish-yellow spots, raised above the infected plant surface like a small blister. Such spots occur principally on the stems but may also be found on leaf sheaths, leaves and even on the glumes.

Later, these yellow spots develop into large, reddish-brown pustules in which numerous one-celled spores are produced. As these pustules develop the leaf or stem covering—or epidermis—ruptures, exposing a narrow, elongated, powdery mass of reddish spores surrounded by the broken edges of the pustule. This prominent rupturing of the epidermis is a feature which assists in distinguishing between stem rust and leaf rust. When rust infection is severe, the pustules tend to coalesce and do not

retain the more or less narrow elongated appearance which is so characteristic of the single pustule.

Numerous spores are produced in these reddish pustules throughout the season, and being very small and light, they are readily distributed by wind. Under favourable conditions, they initiate new centres of infection on stems and leaves of neighbouring plants and may even attack the glumes of the wheat ears.

In a badly rusted crop, it is common to see the ground reddened with the spore dust from affected plants, and at harvest time the header may be enveloped in a cloud of red spore dust.

As summer advances and the plants mature, the red patches change to black, owing to the production of teleutospores—the black, resting spores of the rust fungus. The red and the black pustules, although different in appearance, are really only different stages in the life cycle of the one fungus and do not represent two different diseases.

Significance of the Common Barberry.

Despite the fact that the black spore stage is found commonly enough in New South Wales, it is not considered of practical importance for two reasons:—

(1) These spores are incapable of infecting wheat directly. They are able to continue the life cycle of the rust fungus only in the presence of the common barberry (*Berberis vulgaris*). Following upon infection of barberry leaves, there are produced numerous yellow patches which constitute the "cluster-cup" stage of the fungus. These "cluster-cups" liberate myriads of tiny spores which are blown to susceptible cereals or grass plants where infection leads again to the red rust stage, thus completing the life cycle of the rust parasite.

(2) Teleutospores or black resting spores usually require the influence of wetting and drying or freezing and thawing to stimulate germination. They are adapted to cold weather but not to high temperatures, and in general the temperatures prevailing in the wheat belt proper are not sufficiently low to give them the stimulus required for germination. That they do sometimes germinate under field conditions in this State, however, is indicated by the fact that naturally infected barberries were found growing at Yetholme in 1933. Wherever barberries are present, therefore, these black resting spores of the rust fungus are a potential danger.

The common barberry is not widespread in New South Wales, and only occasional bushes are to be found growing in certain of the cooler districts of the State. Consequently the barberry in this country does not constitute the same menace to wheat production that it does in the United States of America. Nevertheless, it is known to act as an alternate host of the wheat stem rust organism, and its presence must be regarded as a distinct menace to wheat production in Australia.

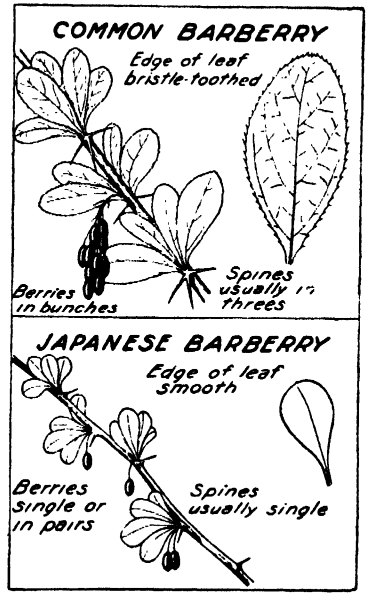

Fig. 3.—Distinguishing Features of the Common Barberry and Japanese Barberry.
The Common Barberry (*Berberis vulgaris*) is extremely susceptible to stem rust; the Japanese Barberry (*B. thunbergii*) is immune from rust.
[*From U.S. Farmers' Bull., No.* 1544.

By virtue of a Proclamation issued in accordance with the provisions of the Plant Diseases Act, 1924, every owner and occupier of land in New South Wales is required to destroy all barberry bushes growing on his land.

The menace of the barberry to wheat production lies not so much in the fact that infected plants may initiate early development of rust, but that they may permit hybridisation or "crossing" of the rust fungus and so "breed" new and possibly

very virulent strains of rust capable of attacking existing resistant varieties of wheat. The best method of combating rust is to grow resistant wheat varieties. It will be realised that the task of the plant breeder in developing resistant varieties by breeding and selection is rendered extremely difficult if numerous rust strains are involved. It is, therefore, obvious that the common barberry should be destroyed wherever present, for it is a "breeding-ground" of potentially dangerous new races of stem rust.

It should be remembered, also, that once established the barberry may be distributed over great distances through the agency of birds which feed on the berries of the shrub. This may result in the growth of barberries in out-of-the-way places where their detection and eradication would be rendered difficult. Even though wheat fields may be some miles distant from where barberries are actually growing, the fact that several grasses are also susceptible to rust means that rust from the barberry may eventually reach the wheat stands per medium of spores blown from occasional and scattered grasses, infected in the first instance, from rusted barberries.

The common barberry is readily recognised by the numerous stalks which arise from below the surface of the ground and grow up to 10 feet in height; the saw-toothed edges of the leaves; the branches which bear stiff thorns in groups of three, and the bright red berries borne in bunches.

If it is desired to grow barberries for ornamental purposes, the Japanese barberry (*Berberis thunbergii*) should be selected. This species is immune from rust.

Eradication of Barberries.

The following methods will be found effective in the eradication of barberry bushes:—

1. If the plant is small, digging out is satisfactory, provided care is taken to remove all root stocks. Bushes and roots should then be carefully collected and burnt.

2. Dry common salt (sodium chloride) applied at the rate of 10 lb. per bush of 12 inches diameter at the base of the clump is very effective. Smaller plants may be treated with a dosage proportionate to the rate of application suggested above. Apply salt in and about the base of the plant.

3. Equally as effective for killing barberry bushes is kerosene. Apply at the rate of 1 gallon per each barberry bush having a group of shoots about 12 inches diameter at the base. If the clump is of 6 inches diameter, use ½ gallon of kerosene whilst 1 pint is sufficient application for smaller plants.

Precaution: Salt and kerosene are toxic to plants other than barberries and unless care is exercised, valuable shrubs or trees may also be killed.

How Does Rust Persist?

The carry over of the disease from the harvest of one season to the spring of the next may thus be effected by several means:—

1. The major means of survival is on self-sown, out-of-season wheat or barley plants.

2. The uredospores or red summer spores are able to persist on certain grasses, such as barley grass.

3. It is possible that rusted straw under special conditions may carry over viable uredospores from season to season.

4. The common barberry is susceptible to wheat stem rust. Wherever present, therefore, it must be regarded as a host capable of carrying the disease over.

Fig. 4.—Plump and Rust-shrivelled Grain.
[*After Freeman.*

Factors Influencing Rust Development.

The initiation of a rust attack depends upon many factors:—

1. Warm, muggy weather with frequent showers and heavy dews, favours the development of rust.

2. Attack ensues only on susceptible host plants. Certain varieties of wheat are resistant or moderately resistant to rust by reason of inherent qualities.

3. Some varieties are quite susceptible, yet are able to avoid rust attack. These "rust-escaping" wheats are early-maturing varieties which ripen so early that the grain is fully formed before rust infection becomes general. The nearer a crop is to maturity at the time of rust outbreak, the better are the chances of yield losses being light.

4. Some fertilisers affect the degree of rust damage by hastening or delaying the ripening process and by affecting the stand. Superphosphate usually hastens maturity and thus aids a crop to escape rust. Nitrogenous fertilisers, on the other hand, may predispose plants to rust attack by increasing succulence, density of stand and lodging, and by delaying maturity.

Control of Stem Rust.

Fallowing and the use of superphosphate, which give the plants a good start and tend to hasten maturity, may sometimes help a variety to escape serious damage following rust infection.

Since the common barberry is susceptible to stem rust and may act as a "breeding ground" for new and possibly virulent strains of rust, it should be destroyed by methods already indicated wherever present.

In certain parts of the State, as on the Murrumbidgee Irrigation Area, wheat is sometimes grown under irrigation. The growing crop should not be irrigated, as the adoption of such a method facilitates the spread of rust. It is far better to flood the land first, and then conserve moisture by cultivation.

The most effective and economical method of combating this disease is to utilise varieties which are resistant to the disease.

Rust Resistant Varieties.

In comparatively recent years, a number of improved varieties highly resistant to stem rust, have been released for distribution to farmers. They include Celebration, Charter, Gabo, Kendee and Yalta. In addition, these varieties have yielded particularly well in field trials conducted by the Department of Agriculture.

Details of the wheat-growing districts for which these five varieties are recommended by the Department of Agriculture were published in the January 1946 number of the *Agricultural Gazette,* and are available as a leaflet on application to the Department.

Certain other varieties, including Ford, Bordan and Ghurka, possess some degree of resistance to rust and these, also, are included in the Departmental list of recommended varieties for certain districts.

Pasture Management and Animal Health.

Importance of Adequate Subdivision.

ADEQUATE subdivision and good management have considerable influence on the health of the stock run on a pasture. On a moderate sized property heavily stocked but with little subdivision, the animals wander at will and carefully select from the pastures those plants which are most nutritious and palatable. Only with difficulty do these plants obtain the opportunity to seed. The more obnoxious and less palatable the other plants are the more opportunity they get to seed and spread. The ultimate result is a holding smothered in undesirable plants. From this results ill health of varying types, from actual poisoning to barely recognsable deficiency diseases. At the same time as this diminution in food value is occurring an increase in parasite population is taking place over the whole area without check.

On a well-subdivided property both these evils are lessened. Rotational spelling provides the necessary opportunity for the recovery of the best plants, and naturally the longer an area is empty of stock the greater will be the mortality amongst the parasites, which term includes not only such things as worms, but disease-producing bacteria as well.

The management of pastures is discussed in a pamphlet obtainable free on application to the Division of Information and Extension Services, Department of Agriculture, Box 36A, G.P.O., Sydney.

Codling Moth Control.

Experiments using D.D.T.,* "666"† and Lead Arsenate at Orange.

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D.D.T. spray, at a concentration of 0.1 per cent., was outstanding in controlling codling moth (*Cydia pomonella*) infestation of Jonathan and Granny Smith apples in comparison with lead arsenate and 0.1 per cent. "666" sprays at Huntley during the 1945-46 season. The average infestations of Jonathans and Granny Smiths, respectively, were 1.2 and 2.7 per cent. in the D.D.T. plots, 11.4 and 16.3 per cent. in the lead arsenate plots and 49.4 and 59.6 per cent. in the "666" plots.

Over 90 per cent. of infested fruits from trees sprayed with "666" had been entered through the calyx.

Analysis of the results (using inverse sine transformation) by comparing the percentages of infested fruits revealed a significantly lower infestation in the D.D.T. plots than in the lead arsenate plots, and also a significantly lower infestation in the lead arsenate plots than in the "666" plots.

A heavy infestation of red mites (*Bryobia praetiosa*) developed on the D.D.T.-sprayed trees in December and was controlled by one application of wettable sulphur early in January. No red mite infestation developed on lead arsenate and "666"-sprayed trees.

Details of the Experiments.

The main aims of the experiment were to determine:—

1. The relative efficiency of D.D.T., "666" and lead arsenate sprays in controlling codling moth.

2. The present degree of control obtained with the lead arsenate spray schedule recommended for the district.

3. The effect of D.D.T. and "666" on other insect pests commonly found on apple trees.

4. The phytotoxic effect of D.D.T. and "666" on the trees and their fruit.

Thirty-six trees of each of the varieties, Jonathan and Granny Smith, were used. For each variety three treatments were arranged in six randomised blocks, each plot containing two trees.

A buffer plot was left between each treatment plot within the blocks. There was also one buffer row of Granny Smiths between the two rows of Jonathans and two rows of Granny Smiths used. The trees of both of these varieties were twenty-five years old and well-grown.

The treatments employed were:—

A.—0.1 per cent. D.D.T.-solvent naptha-wetting agent emulsion.

B.—0.1 per cent. "666"-mayonnaise emulsion.

C.—Lead arsenate schedule (see below).

All the buffer trees were sprayed with treatment C.

Dates of Application.

The calyx spray was applied on 24th October and the cover sprays on 5th and 19th November, 12th December, 2nd and 22nd January, 15th February and 6th March. The Jonathans received six cover sprays and the Granny Smiths seven. By the time the trees in the "666" plots had had a calyx and four cover sprays they were so heavily infested that it was decided to complete their spray programme with lead arsenate in the hope that the infestation might be kept within bounds. Trees in the D.D.T. plots were sprayed with wettable sulphur on 12th January to control the red mite infestation.

* Dichlorodiphenyltrichlorethane (95 per cent. para para isomer).
† Benzene hexachloride (13 per cent. gamma isomer).

Lead Arsenate Spray Schedule.

The calyx spray consisted of 4 lb. of lead arsenate and 1 lb. of calcium caseinate spreader per 100 gallons. In the cover sprays the amount of lead arsenate was reduced to 3 lb. per 100 gallons, with the amount of spreader remaining the same. In the third and fifth cover sprays 1 gallon of white oil was added to the abovementioned spray formula. Lime sulphur, 1½ gallons to 100 gallons lead arsenate spray, was added to the seventh Granny Smith cover spray for the control of black spot.

The average amounts of spray used per tree per application were:—

Lead arsenate	1 3/4—3 gallons.
"666"	1 4/5—3 gallons.
D.D.T.	1 4/5—3 gallons.

These sprays were applied from a power sprayer at a pressure varying between 250-300 lb. per square inch at the pump, using 4 feet 6 inch rods each fitted with twin nozzles with 1/16 inch disc aperture, except in the case of the calyx and first cover sprays, when single nozzles were used.

Orchard Sanitation.

The forks and trunks of the trees had been scraped at pruning time and the over-wintering larvae destroyed. Chemical bandages were applied to all the trees in the orchard on 19th December.

Picking-off of infested fruits and picking-up of windfalls under experimental trees were done regularly and the counts recorded. The infested fruits on buffer trees were not picked-off nor were the windfalls under them picked up.

Harvesting Dates.

The Jonathans were harvested on 6th and 19th March and the Granny Smiths on 30th April.

Rainfall.

In October, 1945, 210 points of rain fell on four days; November, 102 points on four days; December, 205 points on three days; January, 1946, 208 points on four days; February, 247 points on five days; March, 88 points on two days; and April, 127 points on four days. The total rainfall of 1,193 points was 157 points below the average of this period for the last seven years.

Observations.

A fairly heavy infestation of thrips (*Thrips imaginis*) was seen on the trees about a week before the calyx spray was applied, but very little damage was done.

The peaks of emergence of moths appeared to occur early in December and about the middle of January.

Trouble was experienced in the application of the "666"-mayonnaise, firstly because it did not spread readily, and secondly because at the conclusion of each spraying a comparatively large deposit of a yellow, greasy, amorphous mass was found in the bottom of the vat. No such trouble was experienced with the D.D.T. and lead arsenate sprays as both spread readily, particularly the D.D.T., and the deposits in the bottom of the vat were nil or negligible.

Early in December, red mite (*Bryobia praetiosa*) populations began to build up on the trees sprayed with D.D.T., but not on those sprayed with "666" and lead arsenate. The infestation became so heavy by the beginning of January that it was decided to spray the trees on 12th January, and one application of wettable sulphur spray was found sufficient to control the mites.

There was no build up of woolly aphid (*Eriosoma lanigerum*) infestation on D.D.T.-sprayed trees, nor on "666" or lead arsenate-sprayed trees. One small colony of woolly aphids was seen on a buffer tree in the experimental blocks.

Lead arsenate, in the fifth, sixth and seventh cover sprays, applied to trees previously sprayed with "666," had little, if any, effect in holding the heavy infestation built up in these plots.

A small number of fruits (217) on the north-west "corner" of all Jonathan trees (except one) sprayed with D.D.T. suffered varying degrees of sunscald, whereas only twenty-three and nineteen were similarly affected on trees sprayed with lead arsenate and "666," respectively. Only a few Granny Smith fruits were affected by sunscald, and no one treatment could be said to be any better or worse than the other in this respect. Apart from the above, none of the experimental trees suffered from any obvious phytotoxic effect.

Neither the D.D.T. nor "666" sprays had any ill-effects on the operators applying them to the trees.

D.D.T. Residues.

A sample of eight Jonathan apples from the first picking was analysed for residue of D.D.T. 26 days after the last spraying. The residue of D.D.T. did not exceed 10 parts per million on any apple.

Similarly, twenty Jonathan apples from the second picking (13 days after the first) were analysed for residue of D.D.T. 55 days after the last spraying, and the average residue was found to be 6 parts per million.

Nineteen Granny Smith apples were tested for residues of D.D.T. 64 days after the last spraying, and an average residue of 8 parts per million was recorded.

The Results.

The mean infestation of each variety for each treatment is shown in Table I.

Table I.—PERCENTAGE MEAN INFESTATION

Treatment.	Jonathan.	Granny Smith.
	Per cent.	Per cent.
0·1 per cent. D.D.T. ...	1·2	2·7
0·1 per cent. "666" ...	49·4	59·6
Standard lead arsenate schedule	11·4	16·3

Tables II and III show results from the individual plots of Jonathan and Granny Smith respectively.

Discussion.

Although D.D.T. was proved to be outstandingly effective in the control of codling moth as compared with the lead arsenate schedule in these experiments, a number of other factors directly associated with codling moth control programmes will have to be definitely determined before its use by growers can be recommended. The chief of these are the effect of D.D.T. on the parasites and predators of other destructive pome fruit pests such as woolly aphids (*Erisoma lanigerum*), red mites (*Bryobia praetiosa*) and red spiders (*Eotetranychus telarius*); the effect of accumulated residues of D.D.T. over a number of years on the soil and tree growth; and the difficulty of removing excess residues of D.D.T. from the fruit.

Of the abovementioned pests only red mites increased to pest numbers on trees sprayed with D.D.T. in these experiments. However, the other two have been reported in various parts of Australia and the world in similar experiments to have increased abnormally, so it is reasonable to assume that the same may occur at a future date in the Orange district. Red mites were controlled by one application of a wettable sulphur spray, and it is probable that the same results would be obtained against red spiders. Whether the wettable sulphur spray will have to be applied separately or in combination remains to be tested, but there is evidence to hand that D.D.T. and sulphur are compatible when freshly mixed.

Unfortunately, it would not be as easy to control woolly aphids if the parasite *Aphelinus mali,* which is by far the best and only really economical means of controlling these pests, was wiped out by D.D.T. The effect of D.D.T. sprays on *Aphelinus mali,* and therefore the control of woolly aphids, is probably the most important limiting factor to their use for codling moth control. This factor will need very close consideration and observation in future experimental work in the Orange area.

The residues of D.D.T. found by analysis on samples of apples chosen at random do not appear unduly excessive, but until a standard is set very little can be said about allowable residues.

Further investigation of possible sunscald effect on apples sprayed with D.D.T. will be necessary, as no explanation can be given as to why Jonathan apples were much more severely affected than Granny Smiths. Still, the small number affected indicates that it is unikely to be an important factor.

The almost general infestation through the calyx in the "666" plots indicates a lack of residual effect of "666" in the calyx spray, which is not of such importance in the relatively frequent cover sprays. This is further emphasised by the build-up of codling moth in these plots, which led to the proposed spray programme being abandoned. An effective calyx spray, as of lead arsenate, followed by "666" cover sprays, may have produced a different end result.

Further attention should be paid to the effectiveness of D.D.T. in controlling codling moth infestation in light crops, as an

(*Continued on page* 498.)

TABLE II.—JONATHAN APPLES—Results from Individual Plots.

Block.	Treatment.	Total No. of Fruits.	No. of Infested Fruits.	No. of "Stung" Fruits.	Per cent. Infested Fruits.	Per cent. "Stung" Fruits.	No. of Fruits Sun-scalded.
1	0·1 per cent D.D.T.	3,712	27	13	0·73	0·35	44
	0·1 per cent. 666* ...	2,516	806	161	32·03	6·4	...
	Lead arsenate	3,279	122	167	3·75	5·09	6
2	0·1 per cent. D.D.T. ...	2,944	31	71	1·05	2·41	50
	0·1 per cent. 666* ...	1,430	679	102	46·78	7·13	13
	Lead arsenate	1,020	173	150	16·96	14·71	2
3	0·1 per cent. D.D.T. ...	884	16	48	1·81	5·43	12
	0·1 per cent. 666* ...	279	221	26	79·21	9·32	...
	Lead arsenate	680	164	116	24·12	17·06	1
4	0·1 per cent. D.D.T. ...	2,527	19	89	0·75	3·52	65
	0·1 per cent. 666* ...	3,304	1,454	198	44·01	5·99	6
	Lead arsenate	2,742	193	306	7·04	11·16	...
5	0·1 per cent. D.D.T. ...	779	10	24	1·28	3·08	7
	0·1 per cent. 666* ...	1,321	705	59	53·37	4·47	...
	Lead arsenate	2,593	206	289	7·94	11·14	14
6	0·1 per cent. D.D.T. ...	2,479	44	84	1·77	3·39	39
	0·1 per cent. 666* ...	1,815	728	115	40·11	6·34	...
	Lead arsenate	1,548	131	149	8·46	9·63	...

* Lead arsenate schedule used for 5th and 6th cover sprays.

TABLE III.—GRANNY SMITH APPLES.—Results from Individual Plots.

Block.	Treatment.	Total No. of Fruits.	No. of Infested Fruits.	No. of "Stung" Fruits.	Per cent. Infested Fruits.	Per cent. "Stung" Fruits.
1	0·1 per cent. D.D.T. ...	1,382	12	74	0·87	5·36
	0·1 per cent. 666* ...	1,344	677	130	50·37	9·67
	Lead arsenate	1,796	223	351	12·42	19·54
2	0·1 per cent. D.D.T. ...	28	2	6	7·14	21·43
	0·1 per cent. 666* ...	151	126	10	83·45	6·62
	Lead arsenate	255	67	75	26·28	29·42
3	0·1 per cent. D.D.T. ...	1,519	27	149	1·78	9·81
	0·1 per cent. 666* ...	1,511	911	156	60·29	10·32
	Lead arsenate	1,969	389	383	19·75	19·45
4	0·1 per cent. D.D.T. ...	1,906	44	145	2·31	7·61
	0·1 per cent. 666* ...	3,127	1,333	318	42·63	10·15
	Lead arsenate	2,096	274	362	13·07	17·27
5	0·1 per cent. D.D.T. ...	1,555	28	83	1·80	5·34
	0·1 per cent. 666* ...	1,776	1,152	164	64·86	9·23
	Lead arsenate	1,562	227	251	14·53	16·11
6	0·1 per cent. D.D.T. ...	1,277	29	143	2·27	11·19
	0·1 per cent. 666* ...	1,344	749	147	55·73	10·93
	Lead arsenate	1,209	138	195	11·42	16·14

* Lead arsenate schedule used for 5th, 6th and 7th cover sprays.

Part of Hawkesbury College Apiary.

Beekeeping Hints.

W. A. GOODACRE, Senior Apiary Instructor.

The Importation of Soybean Flour

As a Pollen Substitute.

WITH a view to testing the value of soybean flour as a substitute for pollen under Australian conditions, a quantity of this flour with its fat content reduced to about 5 to 7 per cent. has been imported from the United States of America. The importation was sponsored by apiarists' associations and the Producers' Distributing Society, and approved by the State and Commonwealth Governments.

Provided this soybean flour is used to the best advantage, whether mixed and made available as a proprietary line, or used according to the formula published in Beekeeping Notes in the February, 1946 issue of the "Agricultural Gazette" it should prove a valuable asset to the bee-farming industry in Australia.

The Flour Must Be Used to Best Advantage.

The time when there is the most pressing need for a reliable pollen substitute is during honey flows from Yellow Box (*Eucalyptus melliodora*), ironbarks, particularly Mugga (*E. sideroxylon*), and, at times, the White Box (*E. albens*).

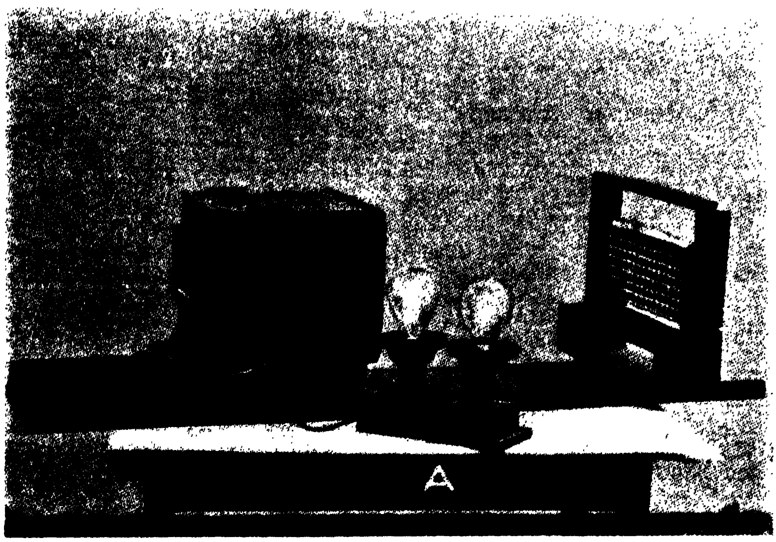
The two last-mentioned species are winter flowering, and along with Yellow Box are good honey trees, but in working them bees often suffer from an insufficient supply of natural pollen to maintain brood-rearing. There is, almost invariably, some risk attached to working winter honey flows, but where there is a shortage of pollen, the result may well prove disastrous to the colonies. It will be obvious, therefore, that if the available supplies of soybean flour are used for general purposes in stimulating brood-rearing, and insufficient is held in reserve for use during the flowering of the species mentioned, then a great deal of the value attached to the importation of the substitute may be lost to the industry.

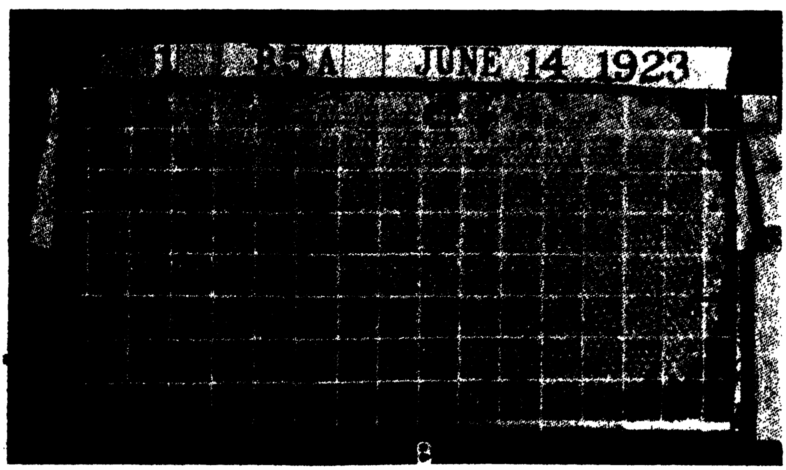
During the flowering of Yellow Box, which occurs during the summer months, a very heavy honey flow may be in evidence. However, if conditions are somewhat on

Photographic Records of Brood Production.

THE accompanying illustrations (from Bulletin No. 1349 U.S. Department of Agriculture) show laboratory equipment used in securing permanent photographic records of brood production in the hive. Considerable scientific data is secured in this way, as it is known that any influence affecting colony welfare is reflected in the brood-rearing activity of the bees.

It is not, of course, suggested that the bee-farmer secure such special laboratory equipment, but it is essential that he make careful observations in the brood nest of the hive during the various phases of seasonal brood-rearing activity. This is particularly necessary also when the bees are experiencing trying times because of natural pollen being in short supply in the fields, or when bees are working a winter flow of honey. With this information the bee-farmer will be in a good position to remedy in time any conditions affecting the strength and spirit of the hives.





Upper.—**Apparatus Used in Obtaining Photographic Records of Condition of Brood.** Showing camera, brood frame holder, with frame of brood in position, wire net and electric lamps. *Lower.*—**Photographic Print, which is Filed as a Permanent Record.**

the dry side and no ground flora or other supporting pollen-producing plants are flowering, then the colonies, being unable to maintain brood-rearing, will become so weakened in strength that it may be necessary to move the apiaries before the flow is half over. This will mean that a large quantity of choice-grade honey will be lost. This is where the soybean flour pollen substitute may prove its value, if fed to the colonies on the first indication of their need for this food. If colony strength can thus be maintained and the bees kept working on a flow from this wonderful honey tree, then something of very great importance will have been achieved.

Substitutes Will Not Overcome all Brood-rearing Problems.

The pollen substitute, of course, should not be expected to work miracles and overcome all problems, particularly during winter honey flows in the cooler areas of the State. For instance, with colonies of bees moved on to a Mugga or White Box flow during winter after brood-rearing has been considerably reduced on the site previously occupied, the "feeding" of a pollen substitute may not be sufficient to allow of the necessary quantity of brood being raised to make-up for losses of adult bees incurred in carrying out field-work during unseasonal conditions.

On the other hand, however, where the hives are moved on to a flow from, say, coastal or other warmer areas, and the colonies have a reasonably well-established brood nest, then the feeding of the substitute nitrogenous food will assist them in keeping up a force of young bees to continue with honey production and survive the trying conditions under which the bees are forced to work. In all cases, however, it is necessary to keep a close watch on the colony welfare when working winter flows in the cooler highland country.

Suggestions for Preparing the Substitutes.

For the beekeeper fortunate enough to secure a supply of soybean flour and who may not have noted the previous recommendations, the formulae are briefly as follows:

	Parts.
Formula 1—	
Soybean flour	4
Dry skim milk	1
Formula 2—	
Soybean flour	9
Medicinal yeast	1
Formula 3—	
Soybean flour	6
Animal yeast	1

The mixtures are fed dry or in paste form. To make the paste, mix 1 lb. substitute with 1 quart of sugar syrup made with two parts of sugar to one of water by volume.

Novel Methods of Queen Introduction.

Many novel methods are employed by bee-farmers to introduce queen bees when re-queening colonies in the apiary. Some of the most prominent bee-farmers use the "paper-bag method". The queen to be introduced, along with a few young workers taken from the hive to which she is to be introduced are placed in a small light paper bag. The top of the bag is folded or tied, and the bag placed carefully over or between the brood combs. The bees release the queen by chewing through the bag. To facilitate the release and to ensure ventilation, a few pin holes may be made in the bag before the queen and her escort are placed in it. This simple method is often used to the exclusion of all others, particularly when introducing a queen from one hive to another in the apiary.

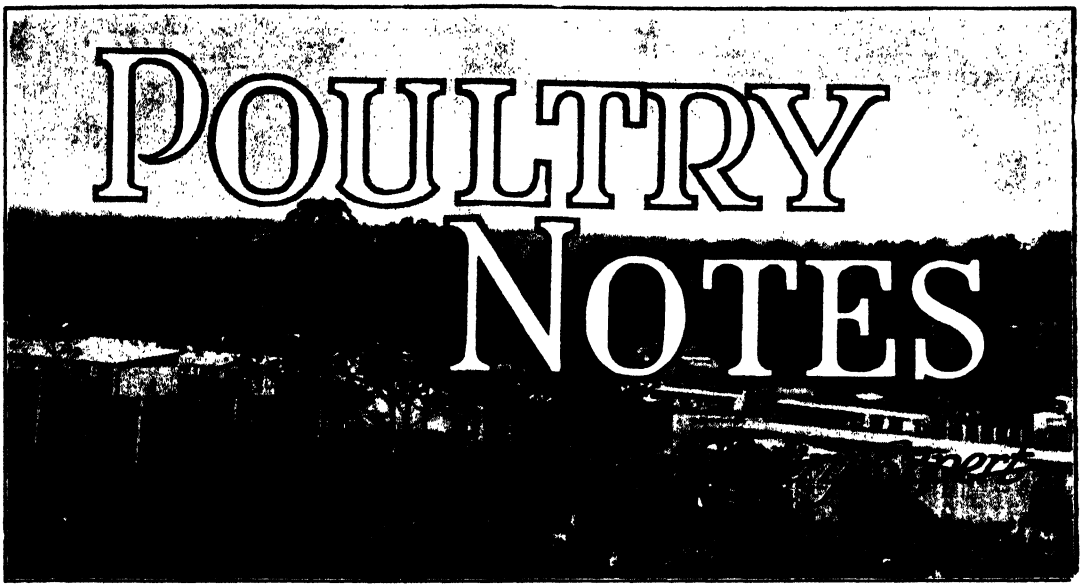
Other novel methods used are the dipping of the queen in thinned down honey or sugar syrup and then placing her direct amongst the bees in the hive to which it is desired to introduce her. As an alternative plan, the bees in the colony are sprayed with sugar syrup, the main idea being to divert for a time the attention of the bees from the strange queen.

A Matchbox Method.

Here is an unusual method used in England, and described in "Bee-keeping," by C. G. Butler, M.A., Ph.D. (Rothamsted Experimental Station).

"Alternatively to introducing a queen by the usual cage method, the bee-keeper may merely catch the queen, and place her with a few young bees from her own nucleus or hive in a previously well-aired matchbox

(*Continued on page* 500.)



Finish the Rearing Season Early.

THOSE poultry-farmers who, owing to shortage of poultry foods, have not raised as many chickens as are required for replacements, should not attempt to make up lee-way by obtaining additional numbers after the end of this month—except perhaps where conditions are ideal for rearing such as on entirely new ground and grassy runs. Even under the best of conditions, however, the season should not be extended more than a couple of weeks, as the late chickens meet with the worst of the summer weather when they are about half grown and in most instances practically cease development until the cooler weather of the autumn commences. Thus, they are two to three months older before coming into production than the earlier-hatched birds.

This is accentuated when the chickens are raised on ground which has previously been occupied by earlier chickens, and in such cases it is not uncommon for pullets (even of the light breeds) hatched any time after the end of September, not to commence production before winter, and, in the case of heavy breeds, until a month or so later. This particularly applies to large scale operations—and those who have previously met with more or less success in raising small numbers of late chickens should not delude themselves by thinking that they can get similar results under commercial poultry farming conditions.

September Weather.

Contrary to the expectations of those inexperienced in the raising of chickens, September is not usually a good month for chicken rearing. Apart from the fact that, in most cases, September chickens are run over ground that has been used for earlier lots, which militates against best results, the changeable weather has a definite bearing upon the health and development of the birds, especially if close attention is not given to management.

THE POSITION THIS SEASON IS:—

THE *use of feed for late chickens cannot be justified.*

All available feed is required for rearing early pullets which will produce better in the autumn.

Large quantities of wheat and flour have been shipped overseas for human consumption and the outlook for this season's crop is not good.

This may result in a further reduction of poultry feed later.

Therefore, feed only profitable birds.

Do not waste feed on unthrifty chickens or cull hens!

One of the common causes of trouble is that, with the advent of a few warm days and evenings, there is often neglect to maintain the temperature in the brooders, and when a frost follows upon a mild evening the chickens pack together for warmth, and as a consequence sweating occurs, which is the forerunner of many ailments, since it lowers the resistance of the chickens to diseases.

In other instances, the mistake is made of moving the chickens from the brooders to unheated pens a week or so earlier than usual, as soon as the warmer weather commences. Then when a cold change is experienced they suffer unless special care is taken to keep them warm. Thus, the only safe course is to pay just as much attention to brooder temperatures as in the early part of the season, and keep the chickens in the brooders for the same period as the early ones.

Short cuts in rearing chickens in order to save labour and obviate the constant work involved, are the sure way to losses or unthrifty stock. It is essential, therefore, that there be no "let up" in care of chickens at any time throughout the season.

Errors Made in Second Stage of Rearing.

Despite the advice given from time to time concerning the handling of chickens after they are transferred from the brooders, and the fact that very successful methods are demonstrated on Departmental Farms as well as on many commercial farms, there are large numbers of poultry farmers who have no proper facilities for accommodating the chickens at this stage.

Frequently chickens are well reared up to 6 weeks of age, and are then ruined by placing them in open-fronted, adult houses without any method of training them to roost. This results in packing into corners and sweating, causing the chickens to become bedraggled and stunted, even if no mortality occurs.

It should be realised that, with suitable accommodation and proper management, there should be little or no mortality after the chickens leave the brooders at 6 weeks of age, and every effort should be made to provide satisfactory equipment and thus save much economic loss through the birds receiving a serious setback at this stage.

Fig. 1.—Continuous House Type of Weaning Pens.

Suitable types of buildings (fitted with roosting ramps) are illustrated on pages 496, 497 and 498, but a modified ramp can be fitted if desired to save expense. Instead of having two frames as shown, one only can be used by placing it about 6 to 8 inches above the floor and having a board along the front to prevent the chickens getting underneath.

It is usually necessary to draft the chickens up on to the ramp for the first few nights, and this should be done at dusk.

In constructing the ramp, care should be taken to nail the netting on the underside of each batten and fit the frame neatly across the end of the houses farthest from the door. No wide ledges should be left for the chickens to crowd on to, or openings between the ramp and the walls in which the birds can become wedged.

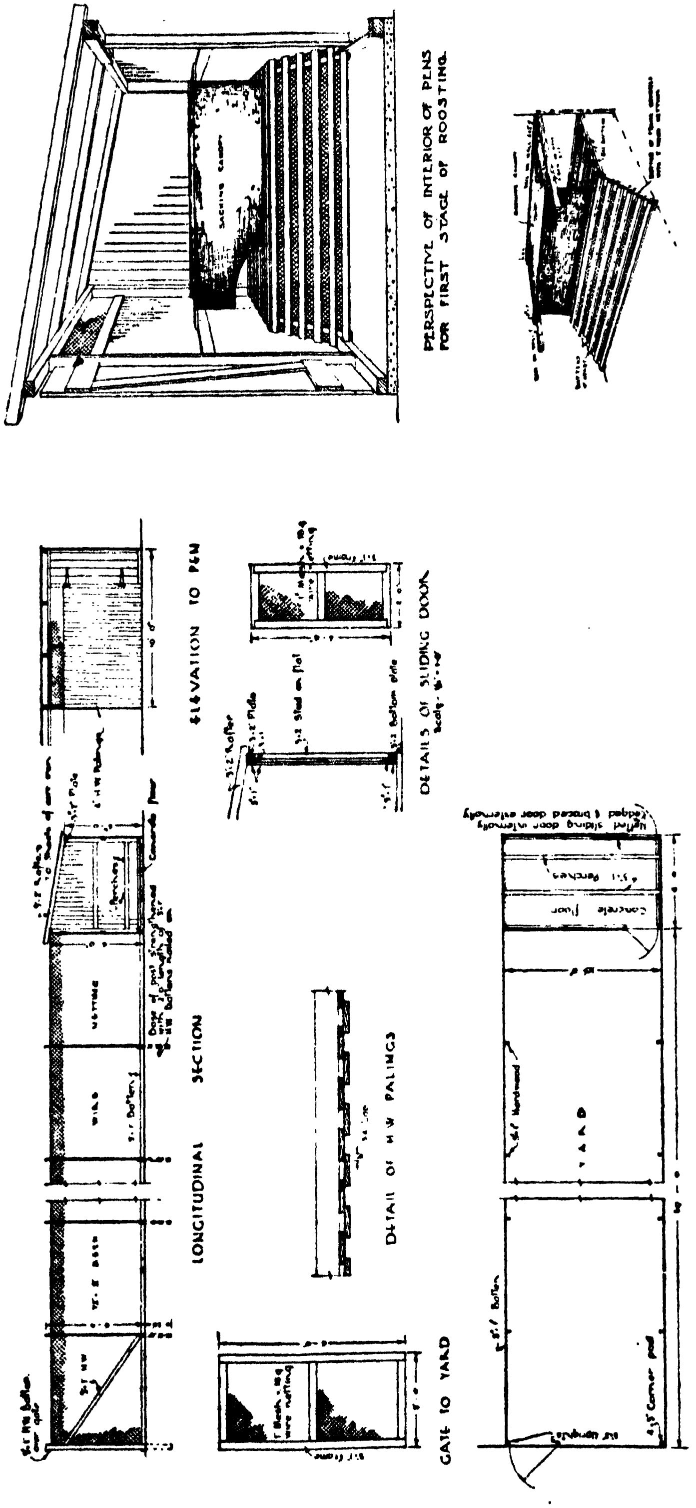


Fig. 2—Details of Construction of Continuous House Type of Weaning Pens.

It is advisable to construct small pens such as illustrated to accommodate 60 to 75 chickens, rather than use large houses, unless a large ramp is fitted across one end in the same way as shown, otherwise it is more difficult to induce the birds to go on it owing to the greater floor space available—and in any case the larger the numbers housed together the greater is the risk of trouble from packing.

be temporarily covered to within about 12 inches of the top, where an opening should be left for light and ventilation, as in the pens illustrated.

When the chickens have been in the pens for a week or so, two main perches can be placed in position, running the length of the compartment and about 15 inches above the floor. When all have taken to these

Fig. 3.—Single House Weaning Pens.

On no account should open-fronted houses be used for birds before they have learnt to roost, but if no other pens are available, the fronts of open houses should

perches, the ramps can be removed and the chickens can be transferred to colony houses, which are ideal for raising pullets to the fully grown stage.

Codling Moth Control—*continued from page* 491.

examination of the D.D.T. results in Table II shows a negligible increase in infestation on the light crops of the trees in blocks 3 and 5 as compared with the very much heavier crops on the trees of other blocks. As it is usual to expect very much heavier infestations in light crops than in heavy crops when sprayed with lead arsenate sprays (as indicated also in this table), this property of D.D.T. of preventing considerable increase in infestation of light crops, if proved consistent, will certainly enhance its value very greatly as a control measure for codling moth. The fact that only two Granny Smith apples of a total of twenty-eight on two trees in block 2 (Table III) were infested, although not conclusive, tends to confirm the results obtained with the Jonathans.

Acknowledgments.

Mr. J. C. Ironmonger's co-operation in making available the trees and spraying equipment and in giving very valuable assistance was greatly appreciated by the authors, and thanks are due to Messrs S.W. Ferguson, Fruit Inspector, and E. Whittaker, Fruit Instructor, for practical assistance during the experiments. We are indebted to Mr. O'Neill of the Chemist's Branch for the analysis of residues of D.D.T. on apples, and to Mr. F. C. McCleery, Biometrician, for analysis of the results.

"FAVUS" OR WHITE COMB DISEASE OF POULTRY.

N. B. KING, B.V.Sc., Government Veterinary Officer.

FAVUS, or white comb, is a chronic fungous disease of poultry which affects the non-feathered and sometimes the feathered portions of fowls. In addition to fowls, turkeys, cage birds, some animals and man may be affected. In fowls it is caused by the fungus, *Achorion gallinae*, **which also infects mice, rabbits and guinea pigs, which may be important links in the spread or perpetuation of the disease. The disease is relatively uncommon in commercial flocks, but has been reported in this State.**

Infection results in loss of production in laying stock and loss of virility in breeding stock. Spread is slow and its importance is thus liable to be overlooked. Birds seldom die of favus alone, but resistance to other infections is lowered.

Favus is seen more commonly in the heavier breeds of fowls, although all breeds are susceptible, and young birds with well developed combs are most likely to be affected.

Symptoms.

The first symptom is usually the development of lesions on the comb and as the fungus spreads, white spots develop. The surface scales off these spots leaving areas which appear as though the comb had been sprinkled with flour—hence the common name, white comb. The wattles and unfeathered portions of the head may be primarily affected. As the disease progresses, the scaly deposits become thicker, forming a wrinkled crust on the surface.

When the infection spreads to the feathered portions, feathers fall out in patches leaving the affected portions thickened, wrinkled and covered with scales and crusts. Feathers plucked out at this stage will show a whitish deposit at the base, which, when examined under a magnifying glass has the form of whitish grey threads. A mouldy odour may be detected.

Lesions also appear in the mouth and upper respiratory system. These take the form of masses of yellow cheesy deposits, ulcers and nodules on the walls and the floor of the mouth and in the throat region. They may extend down to the crop.

General symptoms include depression, poor appetite, weakness, emaciation, anaemia, and sometimes jaundice. On rare occasions the favus organism causes death from pneumonia.

Method of Spread.

The fungus spreads slowly from bird to bird by direct contact. Scales which become detached from the affected areas will contaminate surroundings and re-infection can occur through cuts and abrasions which result from fighting or from eating sharp grit. There is evidence that a break in the skin surface is not necessary—mere rubbing of the two skin surfaces together will transmit the infection.

Treatment.

Badly affected birds should be sacrificed.

A treatment that is good for all affected areas is to apply a mixture of—

Tincture of iodine	1 part.
Glycerine	6 parts.

Repeat in three days.

Formaldehyde ointment may also be used. It is made by melting 1 lb. of vaseline in

Favus (or "White Comb").
[*After Ward Gallagher.*

boiling water and adding 1 oz. commercial formalin to the vaseline solution. Then replace the cover and shake until the vaseline is solidified. One or two applications well rubbed into the lesions is usually adequate.

A 2 per cent. solution of photographic hypo, repeated in three days, is effective on feathered portions.

Prevention.

Methods of prevention include:—

Examination of all imported birds before adding them to the flock; disinfection of all yards and runs which have housed affected birds, using cresol disinfectants, 5 per cent. solution; and control of the numbers of mice on infested premises—as they are a means of spread.

Dairy Herd Improvement Methods in New Zealand.

COMMENTING on some of his observations during his recent visit to New Zealand, the Minister for Agriculture, Mr. Graham, described the work being done in connection with the artificial insemination of stock:

"At the Ruakura Animal Research Station a tremendous amount of research work is being carried out into very many matters affecting the stock-raising industries. In the artificial insemination section the station uses ten of the fifteen leading proven Jersey sires of New Zealand, aged from 7 to 10 years. The daughters of these sires have proved by test that they are capable of producing very high quantities of butter-fat.

As in New South Wales, artificial insemination is used as a means of improving the dairying industry by the use of these proven sires over a wide area, but the difficulty confronting them at present is to provide sufficient sires. In an endeavour to overcome this, the sires on the station have been mated by artificial means with pedigree cows of tested high producing capacity. The bulls from these matings have been mated with other high producing pedigree cows, and these young bulls are now leased to co-operating farmers for three years, during which time their progeny will be tested. Should the daughters of these young bulls prove satisfactory in regard to production of butter-fat, then the bulls will also be included with the other proven sires at the station in the artificial insemination programme.

"A matter of interest in regard to insemination is that every head of cattle on the Farm under the age of four years was bred by artificial methods. Sixty heifers who were themselves the product of artificial insemination will calve this year, and in addition very many of the sheep on the station were also produced by artificial methods."

Beekeeping Hints—*continued from page* 494.

and introduce her to the new colony by means of the so called 'matchbox method.' [Presumably a safety match box is used.]

"Prepare the colony to which the queen is to be introduced, and then, having left the colony queenless for at least twelve hours, place the matchbox with its lid slightly open (just sufficiently open for the bees inside the matchbox to communicate with the bees in the colony, but not wide enough for the bees from the colony to enter the matchbox or for the queen to get out), over the open feedhole of the hive. Twelve hours after, slide the lid of the matchbox half-way open so that the queen can walk straight into the colony. There is no need, indeed it is undesirable, to supply the bees or the queen in the matchbox with any food. The bees in the colony will feed the queen and any bees present with her through the small opening in the top of the matchbox. They thus get to know and accept the new queen."

WINDBREAKS are of substantial value in the conservation of soil moisture. In the immediate lee of a windbreak evaporation is reduced by as much as 60 per cent. The protective zone of a break varies with local conditions, but, generally speaking, it shelters an area equal in width to six to fifteen times the height of the trees. A narrow strip is also protected o nthe windward side. In the protected zone the average reduction in evaporation falls round about 30 per cent., the moisture retained in the soil being available for crop needs. The actual result of a breakwind in reducing evaporation is therefore equivalent to a fairly large increase in rainfall.

ISH-FH

5 Ways to Ensure a Top Quality Milk Yield . .

1 Give your herd full protection against mastitis infection. Sterilise all your dairy equipment with I.C.I. Sodium Hypochlorite — the recognised preventative treatment for mastitis.

2 Watch for early infection symptoms — Test regularly with the strip cup. Isolate all infected cows.

3 Strip by machine and sterilise teat cups with I.C.I. Sodium Hypochlorite before milking each cow. Handle your herd quietly — follow a fixed routine of rapid milking.

4 Use plenty of warm soap water — wash udders and dip teats in I.C.I. Sodium Hypochlorite solution. I.C.I. Sodium Hypochlorite instantly kills the mastitis bacteria.

5 Keep sheds and milking yards well washed and drained. Follow the advice of your Agricultural Department.

SODIUM ICI HYPOCHLORITE

Enquire at your local butter factory or usual supplier.

FULL PROTECTION AGAINST THE WORM MENACE . . . . . .

YOUR best insurance against worm infestation in your flocks is **PHENOVIS** — the effective gastro-intestinal worm remedy. **PHENOVIS** is deadly against large stomach, small intestine or black scour, and other gastro-intestinal worms in sheep and domestic animals.

PHENOVIS is based on phenothiazine — the only known effective treatment for nodule worm. **PHENOVIS** powder is economical to use — its very effectiveness reduces the need for repeated drenchings.

Swiftly, **PHENOVIS** ends flock losses from worm infestation.

Full directions for use are shown on the label on the container.

Available in
1 lb. Tins — 7/-; 7 lb. Bags — 6/8 per pound.
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FEEDS and FEEDING NOTES.

Contributed by

The Division of Animal Industry.

Pasture Improvement and Disease Prevention.

PRODUCERS interested in the improvement of returns from stock raising are paying increasing attention to pasture improvement and the greater use of fodder crops. However, both these practices tend towards higher disease incidence. The greater the improvement in carrying capacity, the greater the attention which must be given to disease control.

Bloat in cattle, entero toxaemia in lambs and hypocalcaemia and pregnancy toxaemia in ewes (pregnacy toxaemia caused through over-fatness), are all increased by pasture improvement and increased use of fodder crops. Control of these diseases is largely a matter of providing coarse feed to balance the lush feed.

Watch the stock which have both lush grazing and coarse natural pasture or hay or straw available to them. They will not concentrate on one feed to the exclusion of the other, but will eat both types of feed. One has only to see the way stock on lush pastures or fodder crops will rush coarse, dry feed such as hay, to realise their appetite for such feed.

In practice, bloat of cattle on improved pastures containing a high proportion of clover or of lucerne; hypocalcaemia in ewes on grazing crops such as wheat and oats; and entero toxaemia in lambs on lush feeds and pregnancy toxaemia in over-fat ewes, can usually be prevented, to a large degree, by giving the stock coarse feed such as cereal hay, straw or chaff to balance the lush grazing.

Coarse roughage to balance lush grazing pays!

Growth Rates of Chickens.

Some Common Fallacies.

A BELIEF common among some poultry-farmers is that when chickens are grown at their maximum growth rates they are "forced." The actual detrimental effect of this "forcing" has never, to the writer's knowledge, been very clearly defined, but the fear of "forcing" is nevertheless quite widespread.

Whilst there is plenty of evidence that moderately slow growth, due to insufficient protein in the feed or insufficient feed, is not harmful to the birds, as they eventually reach the same weight as birds grown quickly, there is also plenty of evidence that growing stock at their maximum growth rates is not harmful. Fast growth means a shorter time before the birds are productive and less feed to produce a grown bird.

"Forcing" with Wheatmeal.

Related to this belief about "forcing" is another—that meatmeal is harmful for chickens. Experiments at the Poultry Experiment Farm, Seven Hills, where excellent chickens are raised on rations containing sometimes 10 per cent. or even more of meatmeal, should dispel this fear. Meatmeal is an excellent source of protein, minerals—8 per cent. or more in a ration does away with any necessity to feed bone meal, shell-grit or ground limestone to growing chickens —and vitamins.

Recent instances of chickens brought to the Glenfield Veterinary Research Station because of various diseases have indicated that many poultrymen are not fully aware of how fast chickens can be grown on a satisfactory ration. At the Research Station, chickens of known ages, and fed rations for maximum growth, have been compared with chickens of similar age considered by their owners to be quite well grown for their age—to the great surprise of the owners.

Well-grown White Leghorn chickens at, say, four weeks should weigh between 7 and 8 ounces each. Birds on rations that are unsatisfactory because of insufficient protein, minerals, vitamins or actual quantity

(*Continued on page* 504.)

Brucellosis-free Herd Scheme (Swine).

THE following is a list of the names and addresses of owners of herds which have been declared brucellosis-free in accordance with the requirements of the Brucellosis-free Herd Scheme (Swine). The work in connection with this scheme has been undertaken as part of the general campaign against this disease and should perform a valuable service to the industry generally. Owing to the limitations of staff it will not be possible for the Department to undertake the testing of herds in general for this purpose, and in future only herds belonging to Government institutions, registered stud herds, or those containing a preponderance of registered stud animals, will be accepted for inclusion in the list. A charge will be made for the work, since the inclusion of a herd in this list should be of benefit to the owner. After a herd has been accredited, two semi-annual tests will be required, and thereafter annual tests, provided that the conditions outlined in the agreement form are strictly adhered to and that negative results are obtained at each test. So far as the elimination of the disease is concerned, apart from placing the herd on the accredited list, this work will continue as at present.

Registered Stud Herds.

Bathurst Experiment Farm, Bathurst.
Boardman, C. M., "Fairmien," Camden.
Campbell, D., "Hillangrove," Wamberal, via Gosford.
Cocks, F. D., "Condalarra," Miranda.
Cowra Experiment Farm, Cowra.
Croft, F., Lugwardine, Kentucky.
Draper, R. E., "Glengar," Capertee.
Foley, J. B., Gundurimba Road., Loftville, via Lismore.
Garrison Battalion (2nd), Manly.
Gladesville Mental Hospital.
Government Agricultural Training Farm, Scheyville.
Grafton Experiment Farm, Grafton.
Harris, K. H., Pennant Stud Piggery, Purchase Road West Pennant Hills.
Hawkesbury Agricultural College, Richmond.
Holland, A. L., Argonne, Tubbul.
Hurlstone Agricultural High School, Glenfield.
Maybin, N. C., Towac, Orange.
New England Experiment Farm, Glen Innes.
Newington State Hospital and Home, Newington.
Ricketts, C. C., "Mangus," Young.
Riverina Welfare Farm, Yanco.
Rydalmere Mental Hospital.
Shirley, G. F., "Camelot," Penrith.
Upston, H. E., Wattle Tree Road. Holgate, via Gosford.
Wagga Experimen Farm, Wagga.
Waterfall Sanatorium, Waterfall.
White, A. N Blakeney Stud, Orange.
Williams, G. R. B., "Gwandalan," Grenfell
Wollongbar Experiment Farm, Wollongbar.
Yanco Agricultural High School.

Herds Other than Registered Stud Herds.

A.G.H. (114 Australia).
Bathurst Gaol, Bathurst.
Brookfield Afforestation Camp, Mannus.
Callan Park Mental Hospital, Callan Park, Rozelle.
Emu Plains Prison Farm.
Glen Innes Prison Camp, Glen Innes.
Gosford Farm Home for Boys, Gosford.
Goulburn Reformatory, Goulburn.
Higgins, J. P., "Koranga," Camden.
Lidcombe State Hospital.
Morisset Mental Hospital, Morisset.
Orange Mental Hospital.
Parramatta Gaol, Parramatta.
Parramatta Mental Hospital.
Peat and Milson Islands Mental Hospital, Hawkesbury River.
Stockton Mental Hospital.

Abortion-free Herds.

THE following herds have been declared free of contagious abortion (Bang's disease) in accordance with the requirements of the scheme of certifying herds abortion-free :—

Owner and Address.	Number in herd.
Registered Stud Herds.	
Armstrong, K. A., "Heathfield," Boorowa	23
Bathurst Experiment Farm (Guernseys)	28
Cowra Experiment Farm (Ayrshires)	55
Department of Education—Farm Home for Boys, Mittagong (A.I.S.)...	54
Dixson, R. C., "Elwatan," Castle Hill (Jerseys)...	22
Fairbairn & Co., C. P., Woomargama (Beef Shorthorns)	173
Farrer Memorial Agricultural High School, Nemingha (A.I.S.)	44
Forster, N. L., Abington, Armidale (Aberdeen-Angus) ...	167
Hann, O., "Bomerah," Barrington (Jerseys)	42
Hawkesbury Agricultural College, Richmond (Jerseys)...	96
Hicks Bros., "Meryla," Culcairn	65
Hill, E. Pritchard, Bowling Alley Pt. (Jerseys)	96
Hurlstone Agricultural High School, Glenfield (Ayrshires)	53
Killen, E. L., Pine Park, Mumbil...	141
McEachern, H., Tarcutta (Red Poll)	61
McSweeney, W. J., "The Rivers," Canowindra (Beef Shorthorns)	95
Martin Bros. "Narooma," Urana-road, Wagga (Jerseys)	160
Navua Stud Farm. Grose Wold, via Richmond (Jerseys)	101
New England Experiment Farm, Glen Innes (Jerseys) ...	46
Peel River Land & Mineral Co., Tamworth (Beef Shorthorns)	100
Raper, F. S., Calool, Culcairn	80
Riverina Welfare Farm, Yanco	135
Scott, A. W., "Milong," Young (Aberdeen-Angus) ...	474
Simpson, F. S., "Gunnawarra," Gulargambone (Beef Shorthorns)	150
Training Farm, Berry	118
Trangie Experiment Farm, Trangie (Aberdeen-Angus)	155
Wagga Experiment Farm, Wagga (Jerseys)	25
Walker, Jas. R., "Strathdoon," Wolseley Park (Red Polls)	37
White, F. J., and Sons, Bald Blair, Guyra (Aberdeen-Angus)	152
Whitelaw, L. A., "Wendouree," Merriwa (Beef Shorthorns)	79
Wollongbar Experiment Farm (Guernseys)	110
Young, A., "Rocklynne," Cudal (Polled Beef Shorthorns)	27
Herds Other than Registered Stud Herds.	
A.G.H. (114th Australia)	66
Callan Park Mental Hospital	45
Department of Education—Farm Home for Boys, Gosford	37
Fairbridge Farm School, Molong	42
N. L. Forster and Sons, "Abington," Armidale ...	62
Morisset Mental Hospital	66
New England University College, Armidale	20
Orange Mental Hospital	61
Peat & Milson Islands Mental Hospital	25
Royal Prince Alfred Hospital, Camperdown "Yaralla" Herd	94
Rydalmere Mental Hospital, Rydalmere	37
Salway, A. E., Cobargo	62

MAX HENRY, Chief of Division of Animal Industry.

Tubercle-free Herds.

THE following herds have been declared free of tuberculosis in accordance with the requirements of the scheme of certifying herds tubercle-free, and, unless otherwise declared, this certification remains in force until the date shown in respect of each herd :—

Owner and Address.	Number Tested.	Expiry Date.
Registered Stud Herds.		
K. R. Armstrong, "Heathfield," Borowa ...	23	18/12/46.
Bathurst Experiment Farm (Guernseys) ...	28	12/10/46.
Berry Training Farm, Berry (A.I.S.)... ...	129	16/10/46.
H. F. Bradley, "Nardoo," Ashford Road, Inverell (Jerseys)	40	13/4/47.
L. W. Campbell, "Dunmallard," Fern Hill Road, Inverell (Jerseys)	39	21/7/47.
E. J. Cattell, "Kapunda," Rob Roy, Inverell (Jerseys)	121	30/6/47.
E. Cheswidden, "Austral Park," Berry (Jerseys)	88	14/1/47.
Christian Bros., Novitiate, Mt. St. Joseph, Minto	25	11/9/46.
B. N. Coote, Auburn Vale Road, Inverell (Jerseys)	85	23/7/47.
Cowra Experiment Farm (Ayrshires)... ...	56	5/7/47.
Department of Education, Yanco Agricultural High School (Jerseys)	64	1/3/47.
R. C. Dixon, Elwatan, Castle Hill (Jerseys)	29	5/3/47.
C. P. Fairbairn, Woomargama	173	17/3/48.
Farm Home for Boys, Mittagong (A.I.S.) ...	59	2/8/48.
Farrer Memorial Agricultural High School, Nemingah (A.I.S.)	44	28/8/47.
N. L. Forster, Abington, Armidale (Aberdeen-Angus)	167	24/5/48.
A. D. Frater, King's Plain Road, Inverell (Guernseys)	107	11/4/47.
W. G. A. & F. J. Frendenstein, "Chippendale," Grenfell Road, Young (Beef Shorthorns)...	47	15/1/47.
Grafton Experiment Farm (A.I.S. and Aberdeen-Angus)	249	30/7/46.
Hawkesbury Agricultural College, Richmond (Jerseys)	119	19/3/47.
Hurlstone Agricultural High School, Glenfield (Ayrshires)	52	21/7/46.
Kahlua Pastoral Co., "Kahlua," Coolac (Aberdeen-Angus)	257	30/11/47.
E. L. Killen, "Pine Park," Mumbil (Beef Shorthorns)	261	25/9/46.
G. Knight, Tannabah, Coonabarrabran ...	60	30/11/46.
Lidcombe State Hospital and Home (Friesian)	111	3/10/46.
Limond Bros., Morisset (Ayrshires)	64	26/4/47.
McGarvie Smith Animal Husbandry Farm, Liverpool (Jerseys)	72	22/2/47.
W. W. Martin, "Narooma," Urana Road, Wagga (Jerseys)	160	11/7/46.
Navua Stud Farm, Grose Wold, via Richmond (Jerseys)	120	8/10/47.
New England Experiment Farm, Glen Innes (Jerseys)	46	18/3/47.
G. H. Newnan, "Bunnigalore," Belanglo (Jerseys)	38	2/12/46.
Peel River Land and Mineral Co., Tamworth (Poll Shorthorns)	110	16/10/46.
W. R. Raper, Calool, Culcairn (Beef Shorthorns)...	86	12/2/47.
D. B. Reid, "Evandale," Sutton Forest (Aberdeen-Angus)	61	23/11/47.
Riverina Welfare Farm, Yanco (Jerseys) ...	130	26/6/46.
A. W. Scott, "Milong," Young (Aberdeen-Angus)	114	11/6/46.
F. S. Simpson "Gunnawarra," Gulargambone (Beef Shorthorns)	167	19/11/47.
Trangie Experiment Farm, Trangie (Aberdeen-Angus)	155	11/3/47.
Wagga Experiment Farm (Jerseys)	15	1/2/47.
Wallaga Lake Aboriginal Station	19	29/4/47.
H. F. White, Bald Blair, Guyra (Aberdeen-Angus)	300	20/4/47.
Wollongbar Experiment Farm (Guernseys) ...	110	16/3/47.
A. Young, "Daylesford," Cudal (Beef Shorthorns)	23	25/2/47.

Owner and Address.	Number Tested.	Expiry Date.
Herds Other than Registered Stud Herds.		
114 A.G.H., Kenmore...	70	6/6/46.
Aboriginal Station, Brewarrina	14	20/5/46.
Aboriginal Station, Wallaga Lake	19	29/2/46.
Australian Missionary College, Cooranbong...	100	30/8/47.
Barnardo Farm School, Mowbray Park ...	53	18/7/47.
Brookfield Afforestation Camp, Mannus ...	197	12/7/47
N. Cameron, Montrose, Armidale (Late New England Girls School)	33	20/2/47.
A. N. De Fraine, Reservoir Hill, Inverell ...	21	8/6/47.
Department of Education, Gosford Farm Home	37	26/2/47.
Ehsman Bros., Inverell	31	22/8/46.
Emu Plains Prison Farm	115	29/1/47.
Fairbridge Farm School, Molong	25	9/7/47.
N. L. Forster and Sons, "Abington," Armidale	6[illegible]	24/5/48.
F. J. Foy, The Valley Farm, Megalong Valley	25	18/12/47.
W. J. Frizelle, Rosenstein Dairy, Inverell ...	134	16/8/47.
Goulburn District Hospital	5	6/11/46.
Goulburn Reformatory, Goulburn	7	27/6/47.
W. S. Grant, "Monkittee," Braidwood ...	23	29/4/47.
A. Haunaford, Braidwood	10	1/2/47.
F. C. Harcombe, Hillcrest Farm, Warialda Road, Inverell	53	10/4/47.
F. W. Hunt, Spencers Gully...	27	16/2/47.
Koyong School, Moss Vale	2	5/3/47.
J. H. Lott, "Bellevue," Rob Roy, Inverell...	41	26/6/47.
Lunacy Department, Callan Park Mental Hospital	43	4/4/47.
Lunacy Department, Gladesville Mental Hospital	20	15/4/46.
Lunacy Department, Morisset Mental Hospital	79	8/3/47.
Lunacy Department, Parramatta Mental Hospital	62	26/7/47.
Lunacy Department, Rydalmere Mental Hospital	57	30/10/46.
J. O. McGufficke, "Lovely Bank," Rob Roy, Inverell	33	25/6/47.
R. G. P. McLane, Ibis Valley, Swanbrook	24	23/5/47.
S. W. Morris, "Dunreath," Swanbrook Rd., Inverell	51	23/5/48.
J. A. Murray, "The Willows," Keiraville...	21	8/8/46.
New England University College, Armidale...	19	1/5/47.
Orange Mental Hospital	63	19/3/47.
Parker Bros., Hampton Court Dairy, Inverell	125	25/8/47.
Peat and Milson Islands Mental Hospital ...	25	6/9/46.
G. T. Reid, "Narrengullen" Yass	167	14/7/46.
C. E. D. Richardson, Kayuga Road, Muswellbrook	78	3/7/47.
V. J. Rolfe, "Mount View," Inverell ...	18	9/2/47.
St. Ignatius' College, Riverview	24	7/7/47.
St. John's College, Armidale	11	20/2/47.
St. Joseph's Orphange, Kendall Grange Lake Macquarie	9	11/6/47.
St. Michael's Orphanage, Baulkham Hills ...	40	4/6/47.
St. Patrick's Orphanage, Armidale... ...	10	15/11/46.
St. Vincent's Boys' Home, Westmead ...	33	9/7/48.
State Penitentiary, Long Bay	13	30/11/47.
W. J. Stephenson. "Hill View," Fig Tree ...	53	1/2/47.
The Sydney Church of England Grammar School, Moss Vale	48	18/12/47.
J. M. Turnbull, "Pastime," Kayuga Road, Muswellbrook	85	20/3/47.
A. B. Weidman, No. 2 Dairy, Aberdeen Road, Muswellbrook	68	3/9/46.
A. B. Weidman, No. 3 Dairy, Kayuga Rd., Muswellbrook	38	6/9/46.
A. B. Weidman, No. 4 Dairy, Kayuga Rd., Muswellbrook	57	2/11/46.
William Thompson, Masonic School, Baulkham Hills	54	10/6/47.
A. G. Wilson, "Blytheswood," Exeter ...	66	23/4/47.
C. Wilton, Bligh Street, Muswellbrook ...	54	12/5/46.
Youth Welfare Association of Australia ...	142	19/3/46.

Tubercle-free Herds—*continued.*

Tubercle-free Areas.

The following Areas have been declared tubercle-free and no cattle are allowed to be kept therein unless subjected to the tuberculin test and found free from tuberculosis:—

Bombala Area.
Inverell Area.
Braidwood Area.
Municipality of Muswellbrook.
Municipality of Queanbeyan.

MAX HENRY, Chief of Division of Animal Industry.

Influence of Feeding on Worm Infestation in Pigs.

PIGS that are kept in good condition by adequate feeding of a balanced diet, rich in minerals, will have their natural disease resistance at a maximum, and will more readily throw off infestations with internal parasites. Once a young growing pig is checked by faulty feeding or management, the way is paved for any worm infestation to complete the upset of the animal's health and produce serious disease symptoms.

Development of internal parasites in pigs is always favoured by wet, muddy unhygienic conditions. Pigs should not, therefore, be allowed access to streams, mud wallows and bogs, but should be kept in dry yards, provided where necessary with concrete wallows so arranged that cleansing is an easy routine duty.

Overcrowding of pigs on pasture or crop paddocks should be rigidly avoided, as the larger number of animals per unit areas the heavier will be the worm infestation, and the more rapidly will the parasites spread.

Full information on the feeding of pigs is given in a 28-page departmental pamphlet entitled "Feeding Pigs for Profit." It is obtainable free on application to the Division of Information and Extension Services, Department of Agriculture, Box 36A, G.P.O., Sydney.

Stage at Which to Cut Broom Millet.

THERE is some difference of opinion even among experienced growers of broom millet as to the right stage for cutting the brush. Many growers do not harvest until the seed is mature, largely because there is some value in the seed, but the quality of the brush suffers and the yield is lighter.

At the soft dough stage of the grain the fibre is fully developed and still has a tinge of green colour. This is the best time to commence harvesting. At this stage the inner fibre at the base of the brush has the same rigidity and colour as the outside of the brush, and the head is well out of the sheath. In a crop that has been allowed to become too mature a brown staining of the tip of the brush appears and red stain, particularly if aphids are present, causes deterioration in quality.

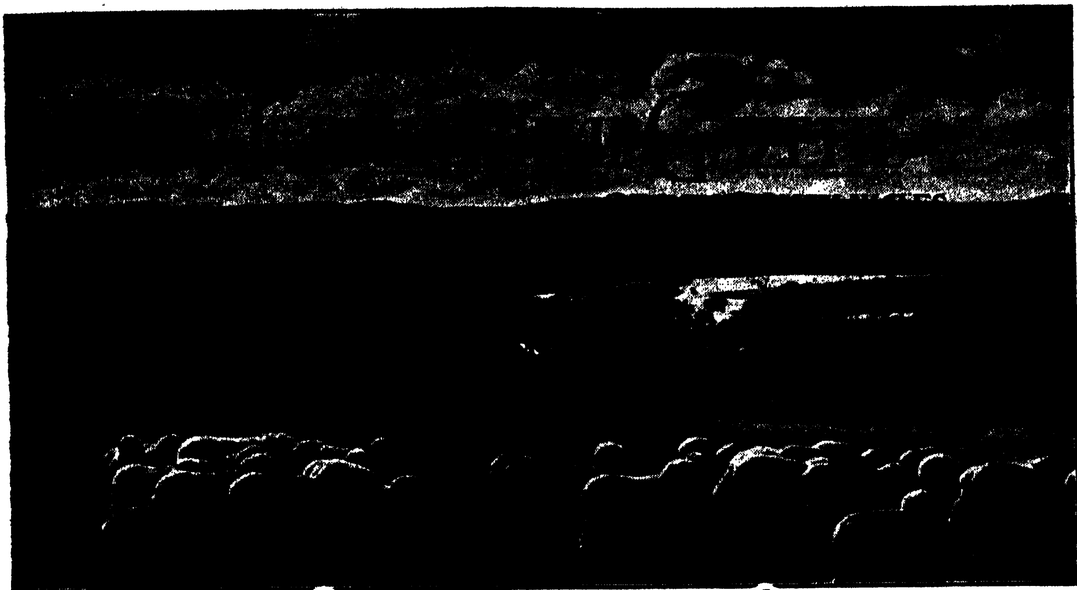
In the United States the brush is harvested in the milk stage, hackled immediately and placed in racks to cure. This results in a uniformly green colour brush of excellent appearance and quality, while the full weight of the crop is secured. The objectionable dust experienced in hackling millet which is almost mature, or has been kept some time before hackling, is avoided by this method. Harvesting at this stage results in a green coloured broom which is favoured by the American housewife, but would need popularising in this country, where the straw coloured broom is favoured.—W. D. KERLE, Special Agricultural Instructor.

Feeding Notes—*continued from page 501.*

of feed, may be as light as 3 or 4 ounces at this age. If protein deficiency is the only cause of the slow growth, the birds may still appear quite healthy, but if the slow growth is due to mineral or vitamin deficiency, sickness and losses are often the final result.

In short, many poultrymen would be advised to give greater attention to the composition of their chicken rations and the growth rates of their chickens, and abandon the idea, if they still hold them, that fast growth and use of meatmeal are detrimental to chickens.

Rations for chickens were discussed in the March, 1946, issue of the *Gazette.*



OCTOBER, 1946.

Editorial . . .

Grain Sorghums to the Rescue.

SINCE the Minister for Agriculture (Hon. E. H. Graham, M.L.A.) made an appeal early in September for the sowing of a record acreage of grain sorghums, useful rain has fallen over much of the parched area, particularly in northern and north-western wheat areas. Those rains should prove timely for final preparation of paddocks for sowing of grain sorghum in districts like Inverell, Tamworth, Glen Innes and other areas of normal summer rainfall.

Wheat growers in the northern half of the State faced a very lean year. With practically no rain for several months, comparatively little wheat was sown. What was sown gave little promise, and, even with recent rains, northern growers who get back their seed will be fortunate. To them, and to those who did not sow at all, grain sorghum offers a second shot at maintaining farm income somewhat near normal level.

Per acre financial return from grain sorghum compares favourably with wheat. In addition, if growers heed the Minister's appeal for a record sowing of grain sorghum, the adverse effect of a small wheat harvest on the stock feed position will be largely offset.

Grain sorghum has a high feeding value, and is exceptionally tolerant of dry conditions. Wheatland Milo, Kalo and Hegari are the best varieties. The former is perhaps the highest yielding grain sorghum suitable for harvesting with the wheat header. Hegari (white grain) and Kalo are also good yielders, and their semi-sweet stalks are very good stock feed after the grain is harvested.

Best months in which to sow are October and November. Sowing can be carried out with the combine or maize drill. Seeding cost is only about 3s. as only 4 or 5 lb Milo and 7 or 8 lb. Kalo or Hegari per acre is required.

Last season's grain sorghum harvest was light, and although this might make seed more difficult than usual to obtain, it should also ensure a ready and profitable market for next harvest, for which the Commonwealth Government has guaranteed a floor price of 3s. 7d. per bushel.

Some idea of the high yielding capability of grain sorghum under the most favourable conditions is supplied by results of tests carried out last year under irrigation at Leeton Experiment Farm. There, yields of 100 bushels per acre were obtained. Yields of 40 bushels per acre can be expected on non-irrigated wheat land, particularly in the north-west, under which conditions grain sorghum should still prove a very profitable crop and one which should enable many wheat farmers to effect recovery from the adverse effects of recent drought conditions.

Seed Wheat Supplies for 1947 Sowing.

THE Minister for Agriculture (Hon. E. H. Graham, M.L.A.) has announced that officers of his Department are co-operating with the Australian Wheat Board in the emergency supply of seed wheat for planting next season.

An estimate had been prepared of the probable seed wheat requirements for next year, following upon a detailed review of the wheat crop prospects within all portions of New South Wales said the Minister, and steps had been taken to hold bagged wheat at suitable stacking sites throughout the wheat districts, from which farmers would be able to take delivery of their seed requirements.

In the selection of stacking sites, special consideration had been given to the need for supplying seed grown within the respective districts, delivery from stack direct to the farmer's own lorries, and, as far as possible to supplying seed of varieties desired by farmers. The stacking sites had also been decided upon with a view to enabling farmers to be present during selection of their seed wheat.

Agricultural Instructors of the Department of Agriculture would co-operate with agents of the Wheat Board in the selection of seed wheat of specified varieties from the wheat stacks.

Generally speaking, said Mr. Graham, there were ample supplies, conveniently distributed throughout the wheat growing districts, and it was not expected there would be any difficulty in distributing seed of the desired varieties.

Details concerning method of application and payment, and the supply and distribution of the seed, would be decided upon at an early date and farmers would be fully advised of the procedure to be adopted to ensure smooth and satisfactory working of the scheme.

Control of Grasshoppers.

Use of Sawdust in Poison Bran Bait.

A MIXTURE of sawdust and bran, now advocated by the Entomological Branch of the Department of Agriculture in the make up of poison bait for control of grasshoppers in place of an all-bran bait, has not previously been used in New South Wales in campaigns against the pest. Experiments were, however, carried out in 1937 with mixtures of equal parts of bran and sawdust at Young and Gunnedah, and these were found to be practically as efficient as bran alone. On the other hand, when bran was omitted and sawdust, molasses and arsenite of soda used, very little kill was obtained.

During my investigations in the United States in 1939, I found that sawdust was used extensively with bran, although the bran commonly known there as mill run bran or shorts was very different from the bran used here. It contained a considerable proportion of pollard or flour-like material in which flakes of bran could be seen. This pollard-like material formed a coating over the particles of sawdust which the grasshoppers ate.

The proportion of sawdust in the mixture varied in different places, but the mixture most commonly used was three times the bulk of sawdust to bran, or 3 bushels of sawdust to 1 bushel of bran.

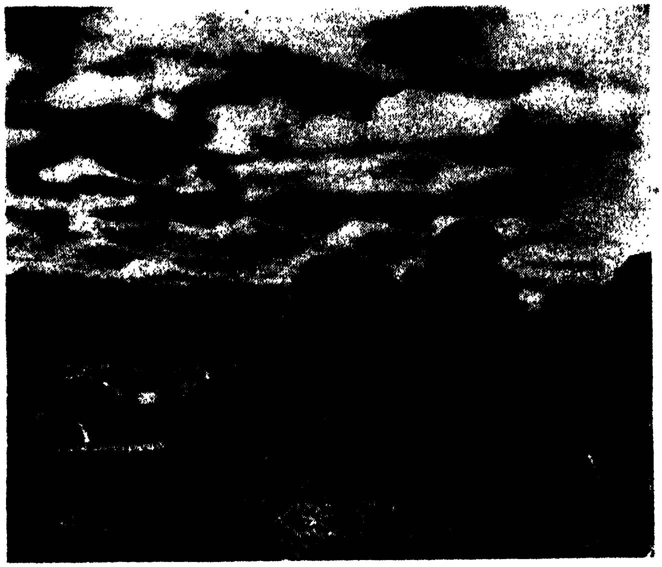
When this mixture is moistened with the required amount of arsenite of soda solution the fine bran or pollard-like material is said to form a poisoned paste which coats the particles of sawdust. The grasshoppers gnaw and chew the sawdust to obtain the coating and are killed by it. The sawdust is not eaten after the coating and moisture are removed. Old weathered sawdust, preferably of a coarse, granular type, should be used.

In view of the shortage of bran, the use of the sawdust mixture should be tried wherever sawdust is available, and it is suggested that equal volumes, not equal weights, of sawdust and bran be used. The chief difficulty, if sawdust is used generally, will be that it will have to be transported a considerable distance in some cases. It would also have to be sieved to remove chips or other rubbish, and bagged.

Directions for mixing poison bait are given in an illustrated departmental pamphlet entitled "The Australian Plague Locust" (Insect Pest Leaflet No. 30), which discusses the whole problem of grasshopper control. The pamphlet is obtainable free on application to the Division of Information and Extension Services, Department of Agriculture, Box 36A, G.P.O., Sydney.

—T. MCCARTHY, Chief Entomologist.

THE SIGNIFICANCE TO THE FARMER OF HIGHER QUALITY WHEAT.



A Panel Discussion at the Agricultural Bureau State Conference.

By Messrs.

J. R. FISHER, B.Sc.Agr., H.D.A., Cereal Chemist;
L. JONES, Miller; and
L. A. JUDGE, Member of the Executive, New South Wales Bread Manufacturers' Association.

IT is quite common knowledge that the major portion of wheat produced is ultimately consumed as bread, but the full significance of the inter-dependence of the wheatgrowing, milling and baking industries is seldom fully appreciated. Whilst each industry has its own particular problems, several are common to all three, and of these the most important is the means by which high-quality bread can be produced.

The price received by the farmer for his wheat is influenced to a very large extent by the quality of the grain, and only if quality is improved significantly can increased prices be expected on the world's markets.

To show the inter-relationship of the three allied industries—wheatgrowing, milling and baking—a lecture in the form of a panel discussion was delivered before the Wheat Industry Session of the Agricultural Bureau State Conference held at Hawkesbury Agricultural College on 16th July.

The following is a report of this discussion:—

MR. FISHER: Without giving the position full consideration, farmers often assume that their only interest in growing wheat in Australia is the return in bushels per acre of their crop, because under the f.a.q. system, all growers receive the same price per bushel. The latter part of this statement is quite true, but it is false to assume that the grower would not receive a greater price per bushel if the general quality of Australian, or even New South Wales, wheat were increased significantly.

Wheat is Bought on a Price-Quality Basis.

It has been said that Australian wheat sells on a price basis; that is, that unless the price is sufficiently low, there is no demand for our grain. This is only partly true, however, as millers always purchase wheat on a price-quality basis; that is, for a given price, the miller must receive wheat

of a certain minimum quality standard, and it is only on account of the general quality of our wheat that a higher price is not received.

Under normal world trading conditions the farmer receives a world parity price for his grain, whether it is consumed in Australia or exported overseas; so it is obvious that if the world parity price of Australian wheat can be increased, the farmer is the first to receive direct benefit.

This price-quality basis will be more fully realised if we consider how the position in England, for example, compares with that in Australia, and I will ask Mr. Jones to make this comparison for us.

MR. JONES: In normal times England imports the greater percentage of her wheat, and therefore draws on supplies from the various exporting countries. Wheat grows in every country in the world, excepting Thailand—even at an altitude of 16,000 feet in Tibet. Every month in the year wheat is harvested somewhere in the world. Of course, not all countries export. Canada, U.S.A., Argentina, India and Australia are the principal exporting countries. Russia used to send quite big shipments away; the Danubian basin also has supplied regular parcels. So England is in a position to obtain the wheats her trade demands.

The diverse characteristics of these wheats influence the resultant flour and thus the bread. How about the bread over there, Mr. Judge, can you tell us something about that?

The Quality of English Bread.

MR. JUDGE: In England, bread is more highly regarded as a staple item of diet than in Australia, and even under the Bread Rationing Plan, the allowance is 9 ounces per person per day, whereas the average daily consumption here in Australia, or in New South Wales at any rate, is only 4 to 6 ounces per person.

This considerable difference may be due to the fact that bread in England is considered to be of higher quality than Australian bread.

Assuming this to be so, can you account for this alleged higher quality, Mr. Fisher?

MR. FISHER: This was partly explained by Mr. Jones when he said that England is in a position to obtain the wheat that her trade demands.

In general we may say that the quality of flour is dependent on the quality of the wheat from which the flour is milled. For example, the protein content of the flour, or the gluten content if you prefer that term, bears a close relationship to the protein content of the wheat gristed by the miller. If a miller starts with grain that contains an inadequate amount of protein, he cannot possibly manufacture a flour of satisfactory protein or gluten content.

The same is true in respect of gluten quality, that is, the gluten quality of flour is dependent on the quality or "strength" of the wheat gristed. Gluten quality may be improved or modified slightly during the different processes in the mill, but it cannot be improved to such an extent as to make strong flour from weak wheat.

Mr. Jones, can you tell us something of the qualities of Australian wheat that appeals to the English miller?

Australian Wheat on the English Market.

MR. JONES: Australian wheats are favoured on the overseas markets principally for: (1) their low moisture content—the grain carries and stores well; (2) freedom of milling (the miller is greatly appreciative of this point)—the grain mills easily and freely, *i.e.*, the inside of the berry separates from the branny portion nicely and a high extraction of flour of good bloom and liveliness is obtained. Flour from Australian wheat is used extensively for self-raising flour and Irish soda bread.

Australian wheat is also favoured on account of its white bran. Can you tell us why this should be so, Mr. Fisher?

MR. FISHER: Farmers and others who feed mill offals, that is, bran and pollard, to stock in England, have contended for a long time that stock do better on offals from white wheats than on offals from red wheats. It must be remembered, of course, that hand feeding is much more extensive in England and on the Continent than in Australia. Recent research, however, has shown that this practical observation has scientific facts as a basis. The red wheats have been found to contain a higher percentage of phytic acid than the white wheats, and phytic acid is capable of rendering calcium insoluble, so making it unavailable

to the animal. These are not really major items, of course, but they are nevertheless points in favour of white wheats.

The Significance of "Bloom."

Mr. Judge, as a practical baker, would you tell us something of the significance of bloom, as mentioned by Mr. Jones?

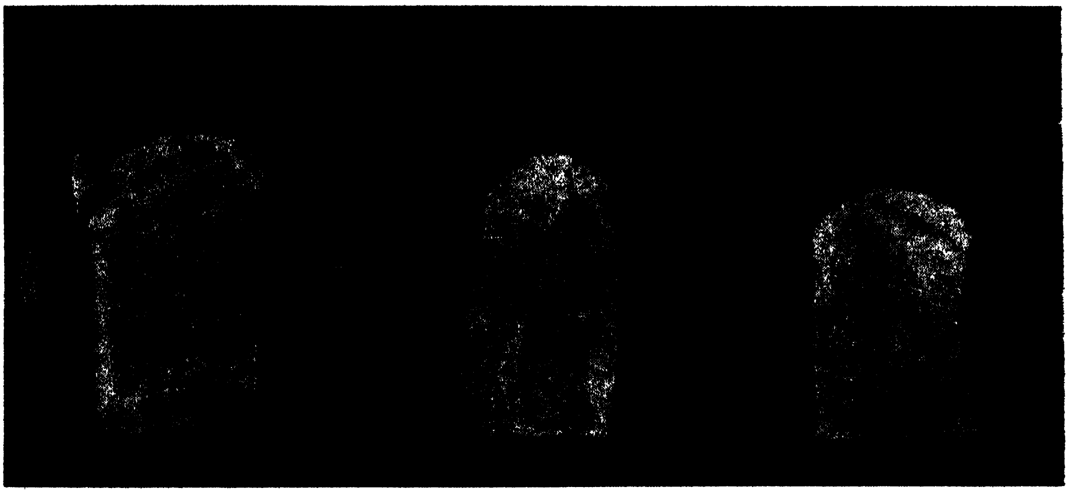
MR. JUDGE: Yes, it is a fact that Australian wheat and flour have gained some repute in England for producing bread with a high quality, pleasing bloom. The term bloom, however, is often used rather loosely to apply to both the sheen of the crumb and also to the crust colour of the loaf. When Australian flours are referred to as producing bread with an attractive bloom, the term is used in reference to sheen; this refers to the whiteness and brightness of the crumb, which may be due to the inherent whiteness of the wheat or to the nature of the gluten.

Crust colour is influenced very largely by the amount of residual sugar in the dough when the loaf goes to the oven; this residual sugar is really a function of the diastatic activity of the flour. Diastatic activity of Australian flour, however, is generally rather low, and for this reason a small percentage of flour from malted wheat is now added almost universally in commercial bakehouses.

A Comparison of Flour Used in England and in Australia.

Mr. Jones, Can you account for the difference between flour used by bakers in Australia and that used in England?

MR. JONES: As I mentioned earlier, England blends the wheats of the world. Australian wheats are regarded as being slightly below "filler" standard on oversea markets—a "filler" wheat is one that will make a satisfactory loaf on its own, but will not carry a weaker wheat. There is considerable variation in Australian wheat, mainly due to seasonal conditions, and, at times, it does reach English "filler" standards, although as a rule this is only achieved for odd shipments. Generally speaking, Australian wheat is criticised for its rather low gluten quantity and quality.



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Types of Loaves Produced from—
1. Flour milled from high quality wheats.
2. Flour milled from F.A.Q. wheat, plus a small percentage of high quality wheat.
3. Flour milled from relatively low quality wheat, of which a large proportion was Bencubbin.

Canadian No. 1 Hard Northern is the strongest commercial wheat on the English market, and American Hard Red Winter wheat is regarded as a filler by English millers.

Strong Wheats Available to Australian Millers.

MR. JUDGE: Mr. Jones, are any wheats grown in Australia comparable with the strong Manitoba wheats?

MR. JONES: Millers here find that some of the New South Wales wheats are even stronger than Manitoba's. Is that not so, Mr. Fisher?

MR. FISHER: Prime samples of our strong wheats such as Pusa 4, Pusa 111 and Cailloux are much stronger than Canadian Manitoba wheat; in fact they are considered to be among the world's strongest in respect of quality. Because, however, most of the grain of these varieties is purchased by our local millers as premium wheat, and the remainder loses its identity by being mixed with other varieties in the f.a.q., overseas buyers are not acquainted with this type of Australian grain.

Dr. Kent Jones, the eminent English cereal chemist, has classed prime samples of the variety Gular as being almost as strong as Canadian Manitoba wheat, but for the reasons previously mentioned, overseas buyers are not acquainted with this type of grain either. Gular is representative of the medium strong class of wheats, a class that includes the varieties Eureka, Fedweb 1, Gabo and Kendee, all of which are of higher quality than average f.a.q. wheat. Thus, if these varieties were grown extensively, the general quality of our wheat would be improved considerably.

The strong wheats, such as the Pusas and Cailloux, are not, however, free milling types and are not regarded favourably on this account, but millers are willing to accept wheat that is slightly deficient in milling quality if it possesses high gluten quality.

Importance of Gluten Quality.

MR. JUDGE: Exactly what do you mean by "gluten quality," Mr. Fisher?

MR. FISHER: The term "gluten quality" is used to embrace two principal physical characteristics of gluten—gluten elasticity and gluten stability. Unless the gluten is sufficiently elastic to expand when the dough is put in the oven, the dough becomes "gluten bound" and will not rise. Gluten stability is an expression used to indicate the ability of the gluten to retain its elastic properties for a period of time; this is important to the baker, because if the gluten does not possess ample stability, the dough is likely to collapse before it is placed in the oven. Higher gluten stability, on the other hand, gives the baker a margin of time within which to work—so that a satisfactory loaf can be produced over a wider range of baking conditions from a commercial flour having high gluten stability than from one of which the gluten stability is low.

You no doubt find this in the bakehouse, Mr. Judge?

Variation in F.A.Q. Quality.

MR. JUDGE: Yes, there is a considerable variation in the quality of our New South Wales flours; this is shown in a number of ways in commercial bakery practice. For instance, flours of low gluten quality and stability do cause a great deal of trouble in the bakehouse, particularly when they lack any degree of fermentation tolerance; this all-too-common fault in many flours has been a particular source of trouble, during the many black-out periods experienced in Sydney during the past few months. It seems that a lack of a reasonable degree of fermentation tolerance in flour has become more common during the past year or so.

There is considerable variation, too, in the water absorption capacity of flour; this variation creates difficulties for the dough-maker and bakers when changing from one load of flour to the next, through the doughs being either too slack or too tight for satisfactory handling in the machines.

The most important point of all in these days of day baking is the fact that gluten quantity and gluten quality have considerable influence on the keeping qualities of bread; it is not possible to make bread that will keep reasonably fresh over long periods from flour of low gluten capacity. In addition, the tensile strength of the slice of bread is influenced by gluten, and any tendency to crumbliness is due to a low tensile strength, the result of low quality gluten in the flour from which the bread is made.

Mr. Jones, why is there such a variation in the quality of flour?

MR. JONES: That there is this variation at times cannot be denied, but I can assure you, Mr. Judge, that the miller's prime concern is to keep the quality of his flour constant. You will perhaps realise how difficult it is for a miller to maintain quality, when you consider that the principal factors affecting variation in quality are: the general quality of the f.a.q. for the year; and the quantity of premium wheat available for purchase.

MR. JUDGE: Well, Mr. Fisher, what factors affect the quality of our f.a.q. wheat?

ONLY one man, the tractor driver, is required. The McCormick-Deering No. 50-T Pickup Baler is an entirely new development in automatic pickup hay baling, and can be hitched to any modern tractor. It gathers the hay direct from the windrow, feeds, ties and separates the bales automatically, eliminating the need for additional operators on the baler. Neat, firm bales of *sliced* hay can be turned out at the rate of two to five bales per minute, or up to six tons per hour according to the class of hay and baling conditions. . . Ask your nearest International Harvester agent to tell you more about the McCormick-Deering 50-T.

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Gluten Quality as an Inherent Characteristic.

MR. FISHER: As I mentioned previously, Mr. Judge, the varieties grown have a bearing on the quality of f.a.q. wheat, because gluten quality is an inherent characteristic of a variety; for instance, all other things being equal, Gular will always be better than Bencubbin.

Leaving the question of varieties out, however, the quality of wheat will vary according to the type of soil on which the crop is grown, and according to the climatic conditions under which the crop matures in the field.

As a general rule, hot dry weather conditions during the ripening period of the crop favour production of high quality grain, and for this reason we find that the strongest wheat is usually produced in our north-western areas.

Soil conditions are also important, because unless the nitrogen status of the soil is sufficiently high, the wheat plant cannot take up sufficient nitrogen to produce grain of high gluten content.

Many farmers (particularly those who come from northern areas) have, no doubt, noticed that there is often a considerable variation in the quality of wheat produced in adjoining paddocks, even when the soil is apparently uniform. This variation, often can be traced to different treatment of the land and different land utilisation, and I would suggest that many farmers who are producing low quality wheat are also obtaining low yields, and that sound farming practice generally leads to the production of higher quality grain.

But tell us, Mr. Judge, what does the baker require in respect of the quality of the flour he uses?

Bakers' Requirements on Flour.

MR. JUDGE: To enable him to produce the best possible loaf of bread the baker requires a flour of a reasonably high gluten content, say 11 to 12 per cent. This gluten must be of a high quality, that is, it must possess both elasticity and stability. Flours milled from wheats of high gluten content are not always suitable for satisfactory breadmaking; the gluten may be hard, tough and inelastic and not respond to fermentation even over long periods.

Then, too, the flour must possess a reasonable degree of gassing power, so that the maximum gas may be developed during fermentation.

Complete and perfect fermentation and baking of a loaf of bread, is the art of synchronising maximum production of gas with correct development of the gluten framework when the loaf goes to the oven. This is possible only when an adequate quantity of high quality, elastic gluten is allied with sufficient gassing power in the dough.

But, Mr. Jones, can you tell me why the miller is not always able to meet these requirements?

Difficulties Encountered by the Miller.

MR. JONES: With approximately 50 per cent. of New South Wales f.a.q. wheat coming from southern areas and a high percentage of Bencubbin in the western wheats, the miller finds it very difficult indeed to meet the bakers' requirements.

MR. JUDGE: Mr. Fisher, what do you recommend that the farmer should do to enable the miller to fulfil the bakers' requirements?

Better Quality Leads to Sustained Demand.

MR. FISHER: It is the policy of the Department of Agriculture to ask farmers to grow the stronger varieties wherever they are found to yield satisfactorily.

I have mentioned that we grow some excellent strong wheats, and some very good medium-strong varieties in some areas, but, unfortunately, some of the weaker varieties, such as Bencubbin, Bungulla, Ranee, Waratah and Ghurka, are grown extensively in some localities. If it were possible to replace these weaker wheats by medium-strong varieties the general quality of our f.a.q. wheat would be increased considerably, and not only would the baker receive better quality flour, but our wheat would command a higher price on the overseas markets, and the demand for our grain would be maintained even in years of world surplus, should that condition come about in the future. Thus the farmer would be the first to receive direct benefit from any marked increase in the quality of our wheat.

NODULATION OF FIELD (CANNING) BEANS.

To Increase Yields and Enrich the Soil.

Possible Causes of Initial Failure in Northern Tableland Soils.

R. J. SWABY, M Sc.Agr., B.Sc., Bacteriologist, and J. B. NOONAN, H.D.A., Agricultural Instructor.

FOR the first time in three years the canning bean crops in the New England district developed beneficial root nodules last season after inoculation with bacterial cultures supplied by the Biological Branch. In 1945-46 crops the same bacteria inoculum, which failed in 1943 and 1944, successfully fixed atmospheric nitrogen, to the benefit of the crops.

This short article traces the history of navy bean inoculation in the State, then gives an account of an investigation into the possible causes of initial failure in the Northern Tableland soils.

History of Inoculation.

Prior to the outbreak of war in the Pacific, navy beans were a relatively unimportant crop in Australia. In 1941 the farming community was asked to grow more canning beans to supply the needs of the fighting forces. At first, scarcely any crops were inoculated with bacteria (rhizobia). During 1942-43 season a bacteriological survey was made of crops growing in the Glen Innes, Guyra, Armidale, Inverell and Bathurst areas, and no nodules were found. Evidently the bean bacteria did not occur naturally in these soils.

The following year it was recommended that this new crop be artificially inoculated with bean bacteria in the hope of promoting nodulation and higher yields. In order to foster the practice, the Department of Agriculture supplied farmers with cultures at one-fifth of normal cost. Many New England growers inoculated their crops in 1943, but still no nodules were obtained, despite the fact that the bacteria had previously been tested in Sydney and found to be effective on both canning beans and French beans. This failure was repeated the following year, although numerous farmers on different soils used the cultures.

Possible Causes of Failure.

Workers in the United States of America have also reported erratic nodulation of canning beans and that the causes were not understood. An investigation was undertaken to determine why no nodules formed on this important crop in this State, and the following possible causes were examined:—

(1) *Unsuitable Bacterial Cultures.*—The Department of Agriculture recommends that agar cultures be used within one month of receiving them so that adequate numbers of live bacteria are introduced on the seed. It was thought that, in some instances, farmers might have kept their cultures for over a month before using them.

Both unused and used culture bottles were collected from growers who had tried them without success. In Sydney these stale cultures were tested against fresh cultures on canning beans and French beans grown in

Root Nodules

sterilized soil and sand. All cultures produced abundant, effective nodules and vigorous healthy plants, despite the fact that some of the bottles were over five months old.

Stunted Navy Beans, Not Nodulated.

It was also found that the same strain of bacteria produced effective nodulation and kept equally well, irrespective of whether it was cultivated on agar media containing extract of lucerne roots or of yeast, glucose or cane sugar, calcium carbonate or calcium gluconate, or whether the bacteria were stored on agar or in peat.

Evidently the cultures despatched to farmers could not be blamed for the failure to nodulate beans on the Northern Tablelands.

Three other strains of bean bacteria were isolated from a few chance nodules found on healthy navy beans growing at Guyra. These new strains were tested out on canning beans and French beans growing in pots in Sydney, but they were not superior to the usual strain normally sent to farmers.

(2) *Acidity of the Soil.*—The soils of the New England district are fairly acid (pH ranging from 5.0 to 6.2), so that the bean bacteria might have been killed before they formed nodules on the roots.

During 1943, field trials were carried out on several soil types in the district to find out whether the application of lime, together with superphosphate, resulted in any benefit. Again no nodulation occurred in the field, but beans grown in Sydney in six soils brought from New England nodulated just as well in unlimed as in limed pots.

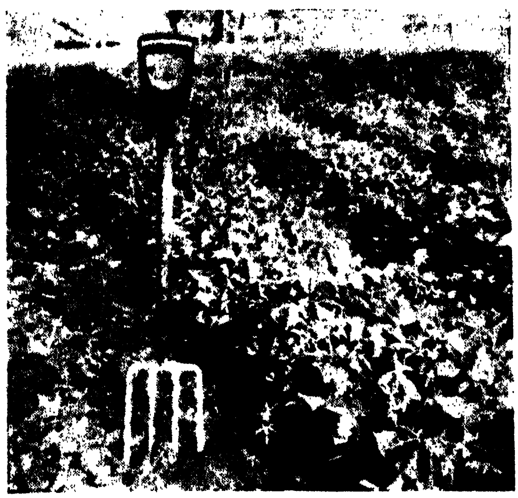
Evidently some factor other than soil acidity inhibited nodulation of the field crops.

(3) *Mineral Deficiency.*—It is true that no mineral deficiency symptoms, other than yellowing due to lack of nitrogen, were noticed in field crops of navy beans; but soils were brought to Sydney to test the influence of various fertilizers on nodule formation.

Two strains of root nodule bacteria produced equally effective nodulation either in the absence or the presence of the following minerals applied singly or in various combinations:—1 cwt. sulphate of potash, 2 cwt. superphosphate, 1 ton dolomite, 14 lb. sulphates of manganese, copper, and zinc, 10 lb. boric acid, 28 lb. iron citrate and 4 oz. molybdic acid per acre.

Hence failure to nodulate in the field was probably due to some cause other than mineral deficiency.

(4) *Effect of Waterlogging and Drought.*—In 1943 navy beans were stunted in the initial stages of growth by heavy rains which fell during germination and waterlogged the soil. On the other hand, in 1944, the growth of the crop was checked by drought.



Healthy Navy Beans, Well Nodulated.

Pot tests were carried out to find whether artificial waterlogging and drought also affected nodulation. It was found that either very wet or very dry conditions shortly

after germination greatly reduced nodulation. The same conditions imposed at flowering time caused premature breakdown of nodules which quickly rotted and disappeared when normal conditions were restored. Now it is well known that waterlogging and drought alter the microbial balance in soil, and it is conceivable that the rhizobia and nodules were weakened by adverse conditions and were attacked by saprophytic micro-organisms.

The fact that the only bean crop which produced nodules during the wet season was grown on a well-drained sandy soil previously under grass, supports the evidence that waterlogging adversely affects nodulatoin. However, another portion of this crop on the same sandy soil, but previously under maize, failed to nodulate, thus suggesting that other unknown factors may have inhibited nodule development.

Successful Inoculation Last Season.

Last season weather conditions were nearer normal, and those farmers who inoculated their bean seed obtained good nodulation. On granitic sandy soils, low in organic matter and nitrates, inoculated crops were superior to uninoculated crops. However, higher yields were not obtained from inoculated crops growing on red basaltic loams or on black alluvial clays, fairly high in organic matter and nitrates, but these soils probably benefited by the atmospheric nitrogen fixed by the root nodule bacteria. It was observed that, in certain cases, land which had grown inoculated crops in previous years, but had failed to produce nodulated beans, gave fairly good nodulation last year despite the fact that no further inoculum had been used.

Inoculation This Season is Recommended.

It is recommended that canning beans be inoculated this season. Suitable cultures may be obtained on application to the Chief Biologist of the Department of Agriculture. Each bottle costs 2s. 6d. (post free), and contains sufficient bacteria to treat 5 bushels of seed. For the cost of 3d. per acre, crop yields may be increased and the soil enriched by nitrogen fixation.

Acknowledgments.

The authors gratefully acknowledge the assistance given by the following farmers who conducted field experiments during the last three seasons:—Messrs. P. B. Dowling, Skeleton Creek; J. V. Johnston, Tenterfield; F. S. Simpson, Guyra; A. J. L. Piper, Ben Lomond; E. H. Smith, Stonehenge; D. P. McCansh, Deepwater; F. Lane, Reddestone; H. T. Finlayson, L. W. Dunn and C. J. Lightfoot, Glen Innes; and N. R. and O. T. Larsen, Reddestone.

Country Killing Works Sites Recommended to Minister.

SITES for the erection of country killing units submitted by constructing authorities at Wagga, Goulburn, Dubbo and Gunnedah have now been inspected and reported upon by the Sites Inspection Committee, which comprises the Country Killing Works Supervising Engineer (Mr. Daveney) and representatives of the Departments of Agriculture, Railways, Public Works, and Health.

In making this announcement, the Minister for Agriculture (Mr. E. H. Graham, M.L.A.) said the Committee had been unanimous in its recommendation of those sites considered most favourable for the location of the proposed works.

The site recommended for the proposed works at Wagga Wagga was located five miles north of Wagga, known as the Bomen Site and was situated west of the railway line adjoining Bomen railway trucking yards.

At Goulburn the recommended site was situated about three miles west of Goulburn, between the main southern line and the Hume Highway in the vicinity of Joppa Junction.

The Dubbo site was located three miles north of Dubbo in an area slightly east of the railway line at a point known as Troy Siding.

The location at Gunnedah is known as the Gunnedah West Coal Siding Site, situated about three miles north of Gunnedah adjacent to the main railway line at the junction of Oria and Emerald Hill roads.

Choice of suitable sites had demanded much attention to detail in order that expansion of nearby cities and towns as well as of surrounding districts should not prove embarrassing in the future to operations of these works, said Mr. Graham. Operational costs as influenced by power, water, transport, by-product treatment and future expansion of the works, together with drainage and erosion problems, as well as the strategic location of all-weather roads, stock routes and resting paddocks, had been carefully surveyed in relationship to convenience of design affecting economy of operation of the proposed works.

A Drive for . . .
THE PRODUCTION OF GRAIN SORGHUM
To Supplement Stock Feed Supplies.

BECAUSE of the unfavourable outlook for the coming wheat harvest in this State, the Minister for Agriculture (Hon. E. H. Graham, M.L.A.) is endeavouring to supplement the supplies of stock feed that will be available next year. To do this he is making an intensive drive for the production of grain sorghum and maize in suitable inland and coastal areas.

Commenting on the situation Mr. Graham said he felt that the present was the time to make such a drive, rather than to wait until such time as a shortage of grain actually existed.

A Profitable Crop in Suitable Districts.

"While grain sorghums cannot be grown in all districts," he said, "they are a reliable proposition in wheat-growing areas of summer rainfall, like the north-west, particularly in and around Inverell, Tamworth and Glen Innes, or under irrigation. Grain sorghum is exceptionally hardy, the setting and development of the grain are not affected by hot, dry winds, and it can withstand periods of dry weather, even reviving after being seriously wilted through lack of moisture.

Farmers interested in the growing of grain sorghums should write to the Division of Information and Extension Services, Department of Agriculture, Box 36A, G.P.O., Sydney, for a copy of a free leaflet which sets out in detail the conditions which suit the crop, the characteristics of the new varieties now grown, the cultural methods, and the uses to which the crop may be put.

Two of the virtues of this crop which should commend it to the wheatgrower are that it can be harvested with the ordinary header with but slight adjustment, and the seeding cost of approximately 3s. per acre is exceedingly light."

Secure Seed Early.

Mr. Graham said that intending growers should secure their supplies of seed as early as possible, but under no circumstances to consider sowing without first dusting the seed, either with Ceresan or copper carbonate at the rate of 2 oz. per bushel. Planting should take place as soon as danger from frost was over, October and November being the best months. During recent years stockowners had learned to appreciate the high value of grain sorghum for all classes of stock, and there would be no difficulty in profitably disposing of the crop for the Commonwealth had guaranteed a floor price of 3s. 7d. a bushel.

Heads of Grain Sorghum Varieties
Left.—Wheatland Milo. *Right.*—Kalo.
Varieties which have given satisfactory results.

Texas Blackhull Kaffir Grain Sorghum at Hanwood, M.I.A.

10,000 Acres on Irrigation Areas.

In inland irrigation areas particularly, endeavour should be made to sow a large acreage; in fact, 10,000 acres should be the objective of farmers in that part of the State. Tests carried out last year at Leeton Experiment Farm showed that yields of 100 bushels per acre could be expected under irrigation.

"I appeal particularly to farmers on the Murrumbidgee and Berriquin Irrigation Areas to undertake large-scale cultivation of this crop," said the Minister. "By so doing they will not only add substantially to their own returns, but also assist the stock industries through an extremely difficult period, and permit of us to maintain the volume of our food contributions to Britain and other distressed countries.

"On the Murrumbidgee Irrigation Area the main concern of many farmers is rice culture, and some of these may be reluctant to undertake the growing of another summer crop. However, if they time the planting of grain sorghum so that it will be ready for harvesting before the rice, it will be possible to handle both crops successfully."

The Department will Assist.

In an effort to organise the large-scale planting of grain sorghum under irrigation, the Minister said that he proposed to make a special officer available to visit and assist farmers individually, advising them regarding methods of cultivation, and in any other direction required. This was in addition to the Agricultural Instructors already located in the districts concerned. He had already arranged for stocks of seed held by his Department at Leeton Experiment Farm to be made available for sowing under irrigation, where maximum yields could be secured.

REFERRING to the payment of relief to cereal growers whose crops failed in the 1945-46 season, the Minister for Agriculture (Hon. E. H. Graham, M.L.A.) said that of 1,500 applications received over 1,000 had already been passed for payment by the Rural Bank, which was administering the scheme.

Nearly £56,000, representing interim payments at the rate of 60 per cent., had been actually paid to growers, added Mr. Graham.

Immediately following completion of this interim payment, arrangements had been made to make final payments, and it was anticipated that all claimants would be paid in full in the very near future.

Pea Vine Residue.

A Very Valuable Stock Feed.

C. WALKDEN BROWN, H.D.A., Senior Agricultural Instructor; R. C. MADSEN, Agricultural Instructor; and G. L. MCCLYMONT, B.V.Sc., Veterinary Research Officer.

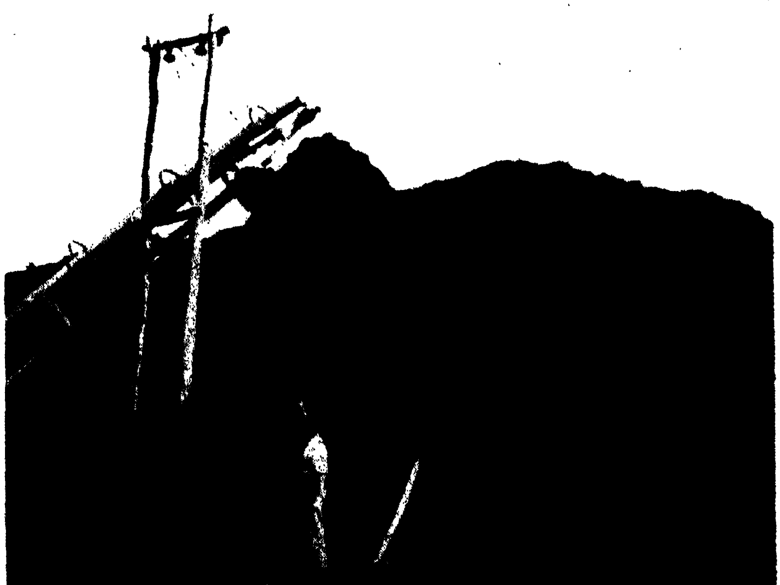
PEA VINE residue—the remains of green pea vines which have passed through a vining machine—consisting of vines and empty pods, or in the case of frosted crops, unfit for canning purposes, vines and full pods is of exceptionally high food value for all types of stock—milking cattle, beef cattle, calves, breeding ewes, fattening lambs, horses, pigs and poultry.

In the United States of America, where the pea canning industry has been in operation for many years, the high feeding value of the residue is well recognised, and an increasing number of farmers in New South Wales are now appreciating its value.

The food value of the residue is comparable to that of lucerne, the protein content of the dry material averaging about twelve per cent. as against fifteen per cent. in average lucerne. Oaten and wheaten chaff only contain about six per cent. The material is also high in vitamin A potency, calcium and riboflavin, the vitamin essential for high hatchability in poultry.

The protein content of the feed makes it particularly valuable for dairy cattle, especially when only protein-poor feeds, such as oaten or wheaten chaff, or cereal grains such as crushed wheat or crushed oats, are being fed, and where protein-rich feeds such as lucerne hay or linseed meal are expensive or scarce. It is also the protein content which makes pea-vine residue such a valuable feed for breeding ewes and fattening lambs.

Silage made from the material should not be fed immediately before milking, as it may taint the milk. It should preferably be



Pea Vine Residue Being Elevated to a "Stack" at Blayney, Season 1945-46.
The "stack silage" was fed to local stock during the winter with no waste.
[*Rural Bank photo.*

fed immediately after milking. Up to 30 lb. per head will be taken by dairy cattle. Experiments have shown that about 3 lb. of the green feed or silage are equivalent to 1 lb. of lucerne hay.

As there is every possibility of the pea canning industry becoming permanent in the Central Tablelands and adjacent Slopes areas of New South Wales, it is considered that more improvements are necessary in some of the methods of handling, conserving and feeding the residue in order to reduce costs and wastage, and maintain the high food value of the residue

Methods of Handling.

There are at least five methods of handling the residue now in operation in New South Wales and an additional method, that of dehydration, could no doubt, if suitable machinery were available, be used successfully on a limited scale.

Stack Silage.

Where the material is to be made into stack silage at the vining stations, an elevator which will allow a high stack to be built up gives satisfactory results, but some wastage. However, if the stack is only as high as can be made without an elevator, wastage is not excessive, and stock will readily eat even the outer material. Care should be taken with badly moulded material, as deaths from botulism might possibly occur.

Once the material is in the stack the desired fermentation takes place, for a time at least, and the material, in a matter of a month or so, becomes blackened and gives off a strong but sweet-smelling odour, and is ready for use.

In order to make the best stack silage it is necessary that the fresh material be stacked quickly, avoiding, if possible, any delay which may ultimately affect its quality. Also, the stacks should be of a convenient size with sufficient height to provide the necessary pressure for ideal "curing" and exclusion of as much air as possible—a difficulty experienced with the building of any open silage stack and which may cause considerable loss through mould.

Although stacks have been fairly well constructed at a reasonable cost in some districts, with little wastage, this method is not considered to be the most satisfactory for handling the material to gain the maximum from its high feed value.

Usually, the material is discharged so rapidly from the vining machines that it requires a considerable number of men to handle it satisfactorily and, further, it is very difficult to keep it away from the vining machines. Also, this form of silage does not lend itself to transport except for short distances from the stacks.

In order to reduce the cost of stack building and to handle more speedily the large volume of material, it is thought that the use of "blowers" may prove successful. If such could be used, the material would be "sucked up" at the point of discharge from the vining machines and "blown" to various positions on top of the stack where it would be evened out by manpower.

Pit Silage.

The pit silo method has been used most successfully in several districts and, although it entails considerable labour in making the pit, the reduction in wastage usually pays for such labour cost. Farmers in the Woodstock district successfully ensiled some 400 tons of pea vines on their properties at a cost of 3s. 4d. per ton which included the sinking of the pit, cartage (only a short distance) and all costs of filling and covering the pits. The material in these pits is of excellent quality, while practically the whole of a nearby "stack" silo is worthless.

Farmers in the Cowra district are conserving large quantities of pea vine silage adding various materials such as crushed wheat to improve the value of the product. Silage made in this manner (by the addition of a carbohydrate-rich meal) turned out to be of excellent quality and a greener sample than silage made without such materials.

A number of well designed pits have been constructed at Oberon and Orange, with excellent results, there being practically no waste in those which have been opened.

Important points to remember in the construction of pits are that they should be of convenient size (not too wide nor too deep), and should be filled quickly, topped off a few times and then well sealed with earth, which should be packed as closely and as tightly as possible.

Where hill sites are available pits should be constructed there, so as to ensure the best possible drainage. Often a carefully selected site will enable excavation costs to be reduced. Soils which are likely to permit water to seep through the walls should be avoided.

Although the cost of filling pits is reasonably light, that of removing the material is heavy, and it does not lend itself to transport, except for short distances.

Tub Silage.

Excellent results have been obtained by adopting this method. Pig netting, lined with sisal-craft, is used and very little waste has been experienced.

Also, reasonable success has been obtained by using prefabricated, quickly erected, open-topped silos using cement sheets of various thicknesses and topping the filled silos with earth. In some instances, labour entailed in topping such silos with earth has been considerably reduced by the use of mechanically operated elevators.

Green Feed.

In some districts, the fresh residue has been carted direct from the vining machines to the paddock. Stock have taken to it readily and have put on condition. Sometimes, however, they may not touch the material for an hour or two until it has partially dried out.

When distributing the material in the paddock two points should be remembered: (1) it should be spread out in a thin layer to prevent moulding; and (2) it should be spread out over a convenient area so as to enable all stock to have ready access, for if it is confined to a small area the more robust animals may benefit at the expense of the weaker and more timid.

Fresh residue has been railed from the Oberon district direct to metropolitan dairymen without undue heating. These dairymen have expressed the opinion that it is "first-class feed and the only thing wrong with it is that there is not enough of it." The dairymen also consider that the material should be used quickly on receival, particularly during hot weather as otherwise it tends to "go sloppy."

Loose or Baled Hay.

Very good baled hay has been made from the residue by a few farmers. The hay, if well made so that little or no leaf is lost, can be regarded as nearly equal in value to average lucerne hay. Accordingly, it is suitable for all stock and especially suitable for dairy cattle and sheep. Horses, too, eat it readily.

The chief difficulties with regard to this method are first, to obtain a large area adjacent to the vining machines over which the material can be readily, evenly and lightly spread in order to permit a partial drying and to prevent moulding; and second to provide for the material to be raked into windrows and then either baled or stacked as loose hay, the former being the most desirable method as it is very convenient for handling, storing and maintaining the high food value.

Naturally, if heavy rain falls on the material whilst it is drying in the field the work is held up and moulding is possible. Also, with a large volume of material being discharged by the vining machines, sufficient suitable machines and labour must be available to spread the material rapidly. Good drying weather is essential for most satisfactory results.

As the residue is severely "beaten" during the vining operation the possibility of losing valuable leaves during drying must be kept in mind.

If such an operation could be perfected and carried out at a reasonable cost, then the product should find a ready market, particularly with the metropolitan dairymen.

Frosted vines are somewhat more difficult to make into hay, but nevertheless they provide a product of high protein value.

A chemical analysis of three samples of hay are as follows:—

	Moisture Per cent.	Protein Per cent.
From the viner	9.2	9.5
From hand-picked vines	9.1	10.4
From frosted vines	8.8	12.4
Lucerne	10.0	15.0

Dehydration.

There is a possibility that silage will be processed by dehydration and grinding to produce various types of stock meals. Its high vitamin A potency and riboflavin content would make it an excellent feed for inclusion as 5 to 10 per cent. of chicken and breeding rations, and pig rations.

An advantage of dehyrating silage over actual vines is that the work can be done in the off season. If vines could be dehydrated they would have to be treated during the busy harvesting period, requiring considerably more machinery and labour, thus increasing the cost of production.

Sufficient machinery is not available in Australia for dehydrating the large quantities of fresh residue which have to be handled at the many vining stations.

The following is an analysis of poultry foods in leaf meal form:—

	Protein Per cent.	Crude Fibre Per cent.
Lucerne	20.2	24.8
Pea Vine	17.2	16.5
Turnip	26.2	7.6

Possible Improvements in Methods.

From the above it will be seen that already there are several satisfactory methods available for handling the large quantities of pea vine residue which may be expected even in a normal season.

As time goes on it is considered and hoped that some major improvements in each method will be made until the maximum value is derived from this valuable stock feed.

D.D.T. as a Control of Caterpillars Attacking Peaches.

DURING past seasons the maize or tomato caterpillar (*Heliothis armigera*) has assumed plague proportions in the Murrumbidgee Irrigation Area, and much damage to peaches, apricots, and, to a lesser extent, pome fruit has resulted. During late October and early November, 1945, these caterpillars were found to be damaging peaches on several farms in the Leeton district, and it was decided to test the value of D.D.T.-solvent naphtha emulsion as a control.

Originally these caterpillars attacked the seed pods and foliage of Burr clover growing in the orchards, but once the clover plants commenced to "hay off," and the seed pods to harden, the caterpillars migrated to the peach trees where they attacked the young developing fruit. The caterpillars were found to be concentrated on the lower third of the trees, and at the time the spraying tests were carried out the majority had just about become fully-fed, although odd half-grown specimens were observed. The tests were carried out on Mr. F. Attenborough's farm at Yanco where Pullars Cling peach trees were found to be heavily infested.

D.D.T.-solvent-naphtha emulsion at the following concentrations, viz., 0.1 per cent. and 0.05 per cent. was applied with a knapsack spray on 2nd and 5th November, 1945, respectively, 3 gallons of spray being found sufficient to cover the lower third of four trees in each instance.

Observations.

(*a*) With 0.1 per cent. D.D.T., approximately 5 minutes after spraying all the caterpillars had left the fruit and fallen to the ground where they were observed to be showing distinct signs of distress. They had little control over their powers of movement and were just floundering about on the ground. Sprayed specimens were collected and placed in jars with fresh lucerne at 4.30 p.m., and at 9.30 a.m. the following day all were found to be dead. On 5th November the rubbish around the sprayed trees was examined, when dozens of dead caterpillars were observed together with specimens of green lace-wing flies, blowflies and a few adult ladybird beetles. On the unsprayed check trees the caterpillars were still numerous and active, whereas on the sprayed trees no caterpillars were observed.

(*b*) D.D.T. at a concentration of 0.05 per cent. was applied on 5th November, and its action was identical with that of the stronger solution.

Conclusions.

1. D.D.T.-solvent naphtha emulsion at concentrations of 0.1 per cent. and 0.05 per cent. is very effective in controlling the maize or tomato caterpillar and spraying immediately renders them incapable of further damage.

2. No ill-effects were observed on developing fruit or foliage on sprayed trees.

—E. J. WASON, Entomologist.

Approved Seed—October, 1946.

To assist in the production and distribution of approved seed of recommended varieties of crops and vegetables, the Department publishes in this list each month the names and addresses of growers of such seed.

Cauliflower—

Shorts—H. Burton Bradley, Sherwood Farm, Moorland.

The Inland Green Tree-hopper.

(*Caedicia simplex* Walk.)

An Important Pest of Canning Peaches.

E. J. WASON, B.S.Agr., H.D.A., Entomologist.

THIS species of tree-hopper, which occurs in the inland areas of New South Wales, is responsible for considerable injury to both stone and citrus fruits throughout the Murrumbidgee Irrigation Area. The injury is characteristic, and consists of holes of various sizes caused by the hoppers gnawing into the flesh of the fruits. Where peaches and nectarines are attacked the damage may vary in extent from "pin-head" size up to areas covering most of the surface of the fruits, and may be as much as ½ inch in depth.

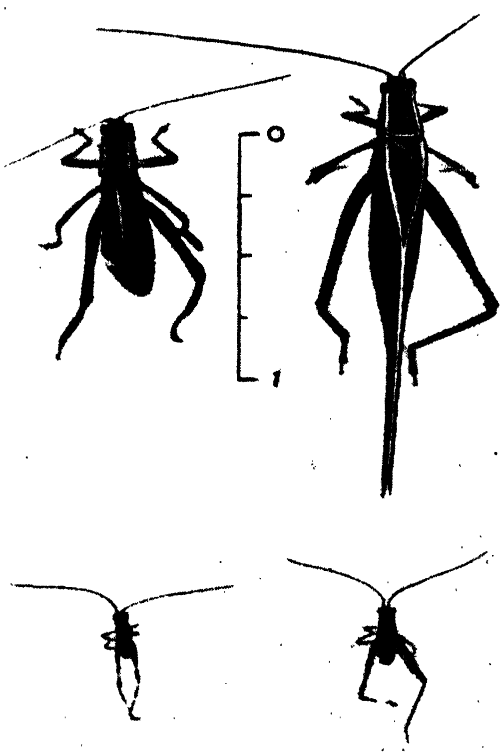
Where citrus is infested, most of the injury occurs soon after the fruit has set. The epidermis or rind is gnawed away, and as the fruit increases in size these areas become very noticeable. By the time the fruit reaches maturity the parts attacked appear as sunken silver-coloured patches, which vary in size from about ¼ to 1¼ inches or more, across.

These tree-hoppers belong to the family *Tettigoniidae*, the members of which are known popularly as long-horned grass-hoppers.

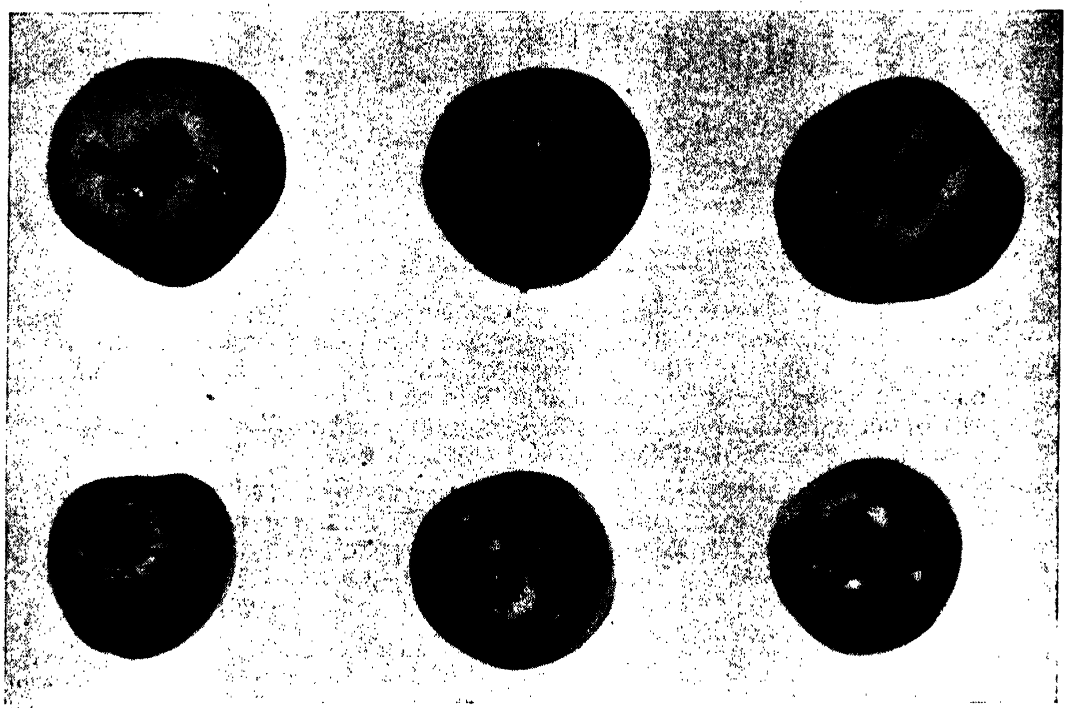
The adult is of a uniform pale-green colour, with a pair of narrow, leaf-like, thickened, protective forewings, beneath which is to be found a pair of transparent, gauzy flying wings. From the front of the head to the tips of wings it measures from 1½ to 2 inches in length and has a wing-spread of about 3 inches. A conspicuous narrow, yellow band defines the upper surface of the thorax, and is continuous with the wing margins. The inner sides of the hind legs and the wing margins are yellowish in colour. The body is relatively short, being about ¾ inch in length and rather plump, and the hind legs are formed for jumping. The female is somewhat larger and more robust than the male, and has a short upturned ovipositor. The whole insect has an angular flat-sided appearance.

Life History.

The eggs, which are deposited during the late summer and autumn months (from late January until the end of March), are laid in masses and are usually packed in more or less parallel rows. These egg masses, which are small, are extremely difficult to detect as they are a similar earthy-brown colour to the soil with which they are more or less covered. The eggs are kidney-shaped, and flattened on each side. They measure about ¼ inch in length and slightly more



Various Stages of the Inland Green Tree-hopper.
[*Photo by A. E. Vincent.*



Peaches and Nectarines showing Typical Damage caused by the Green Tree-hopper.
[*Photo by A. E. Vincent.*

than 1/16 inch in width. Eggs which are deposited in the autumn, overwinter in the soil and hatch in the spring. The earliest record of eggs hatching is mid-September, and emergence is at its peak during late September and early October.

The young hoppers, which are to be found about the bases of the trees, on herbage and the sucker growth of stone fruit trees, are very active and gradually work their way up the trees. Occasionally, some hoppers have been observed in the upper portions of the trees at the end of October.

The newly emerged hoppers are light-green in colour with distinct, dark markings on the upper surface of the thorax, abdomen and legs. They measure about ¼ inch in length and have delicate, thin antennae which are two or three times the length of the body. They grow by a series of moults, and there are five immature stages from the time of emergence from the egg until the mature or adult stage is reached. The darker body markings gradually disappear with each moult, and it is not until after the third moult that the wing buds are visible. In no instance, until the adult is reached, do the wings cover more than half the abdomen.

The adults commence to appear in numbers during late December and early January, although a few individuals have been observed during late November. Only one generation occurs during the year.

Feeding Habits.

The early nymphal or immature forms feeds on the low-borne foliage of stone fruits, gnawing irregular-shaped patches out of the leaves, but this damage, however, is slight. The hoppers graduallv work their way up into the heads of the trees, feeding on the foliage until the developing fruit becomes sufficiently attractive during late November, December and January.

Canning peaches may be severely attacked. The intermediate clingstones suffer more damage than the later varieties although, at times, the varieties Golden Queen and Pullar's Cling have been severely injured. The injury to nectarines occurs earlier than that to peaches, and may be very severe. Apricots, plums, prunes, apples, pears and grape vines may also be attacked, and gums (*Eucalyptus*) also serve as food-plants.

As an individual tree-hopper is capable of damaging many fruits, only a few hoppers per tree may result in considerable

losses, because damaged peaches are unsuitable for choicest canning lines and can only be used, after being trimmed, as sliced peaches or for jam making.

The amount of injury varies from orchard to orchard, and it is not usual to find hopper damage occurring uniformly throughout a block of trees. On some trees large numbers of the fruits may be marked, while on adjacent trees none may be injured.

Counts of fruits, made at random in various blocks of canning peaches, during past seasons, have indicated that the number of fruits injured may be as high as given in the following table:—

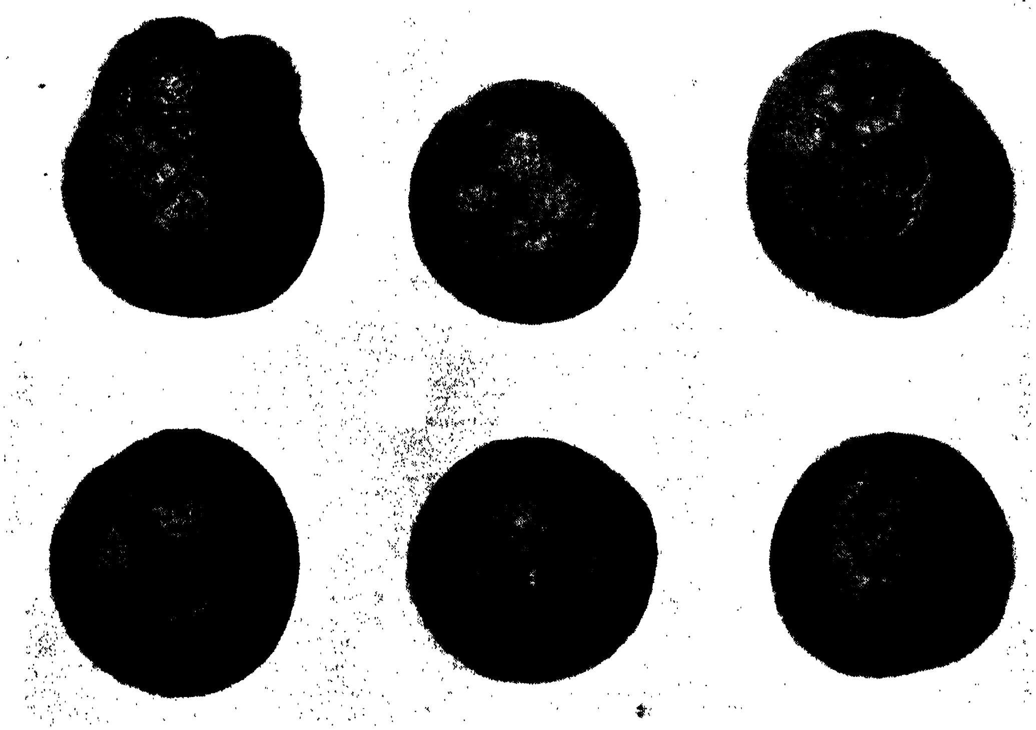
Variety of Peach.	Percentage of damaged fruits.
Selma	21.97
Palora	17.6
Phillip's Cling	14.5
Golden Queen	10.2
Pullar's Cling	2.9

Control Measures.

Control on peaches may be obtained by the use of sprays containing either barium fluosilicate or lead arsenate, applied early in the season, while the young hoppers are feeding on the foliage, and before the fruit becomes sufficiently attractive for it to be attacked.

Barium fluosilicate is preferable to lead arsenate as it causes little or no injury to the foliage of stone fruits, and it is now used generally by growers of stone fruits in the Murrumbidgee Irrigation Area. This chemical, which should contain at least 80 per cent. active ingredients, is used at the rate of 1 lb. to 40 gallons of water.

This spray should be applied as a mist, and it is not necessary to drench the foliage. Where the young hoppers are ascending the trees, it is often necessary to spray only the sucker growth and the lower half of the trees. If this spraying is not completed



Citrus Fruits Damaged by the Green Tree-hopper.
The damage was caused when the fruit was small—soon after setting.

Photo by A. E. Vincent.

during the latter half of October, however, it will be necessary to spray the whole of the trees before mid-November.

Where citrus is attacked, the spray should be applied soon after the first setting of fruit has taken place—usually about mid-October—when only the outer foliage and young fruits need be sprayed.

Danger of Arsenical "Burning."

Peach and nectarine foliage is very liable to arsenical "burning," and it is essential, therefore, to add a "corrective" to lead arsenate if this is used, to counteract such injury. The "correctives" commonly used for this purpose are fresh hydrated lime, zinc sulphate or a combination of both. Ferrous oxide and aluminium oxide may also be used.

The lead arsenate is used at the rate of 1 lb. of powder to 40 gallons of water, plus 5 lb. of fresh hydrated lime.

Under certain conditions, even when a "corrective" is added to the lead arsenate, some foliage injury and leaf drop, as well as injury to the lateral growth on peaches and particularly nectarines, may occur. Moisture plays an important part in the degree of arsenical "burning," and injury is more noticeable in a wet season.

Arsenical injury to the leaves is indicated by circular spots and ragged dead tissues along the margins. The tissues in the spots at first appear lighter in colour, due to the loss of green pigment, and then water-soaked. The injured cells die and become brown and they dry out. Later the dead tissues fall out giving the foliage a "shot-hole" appearance. The injury frequently increases until all parts of the leaves are affected and the tissues become yellow and eventually dark-brown.

The injury to the lateral growth, particularly on one-year-old wood, is of a dark-brown necrotic type, and is usually most pronounced at the base of the buds where the tissues may be killed to a depth of about 1/16th inch.

A 50 per cent. lead arsenate dust has given satisfactory results in experiments, but calm conditions are essential for its application.

Limited tests with 0.1 per cent. D.D.T., both as an emulsion and a suspension, have given promising results as a contact spray for the control of tree-hoppers infesting canning peaches.

Lead arsenate is not usually recommended for citrus trees if other materials are available. Cryolite at the rate of 1½ lb. to 40 gallons of water, plus 1 quart of white oil as a spreader, has been found effective in the Gosford district in controlling the citrus green treehopper.*

* HELY, P. C.—1945. *Agricultural Gazette, N.S.W.*, Vol. LVI, pp. 166–168, 178.

Bush Fire Danger.

Many Areas in Tinder-like Condition.

IN a recent warning concerning the serious danger existing from bush fires, the Chief Secretary, Mr. Baddeley, emphasized the need for constant alertness and the adoption of every possible precaution against outbreaks.

He asked residents in danger areas to pay particular heed to drying undergrowth and vegetation around their homes and other premises. Now was the time to clear it away and destroy it under safe conditions. Local councils had powers to issue directions where precautionary measures had not been undertaken voluntarily. They should not hesitate to exercise them if the occasion demanded it.

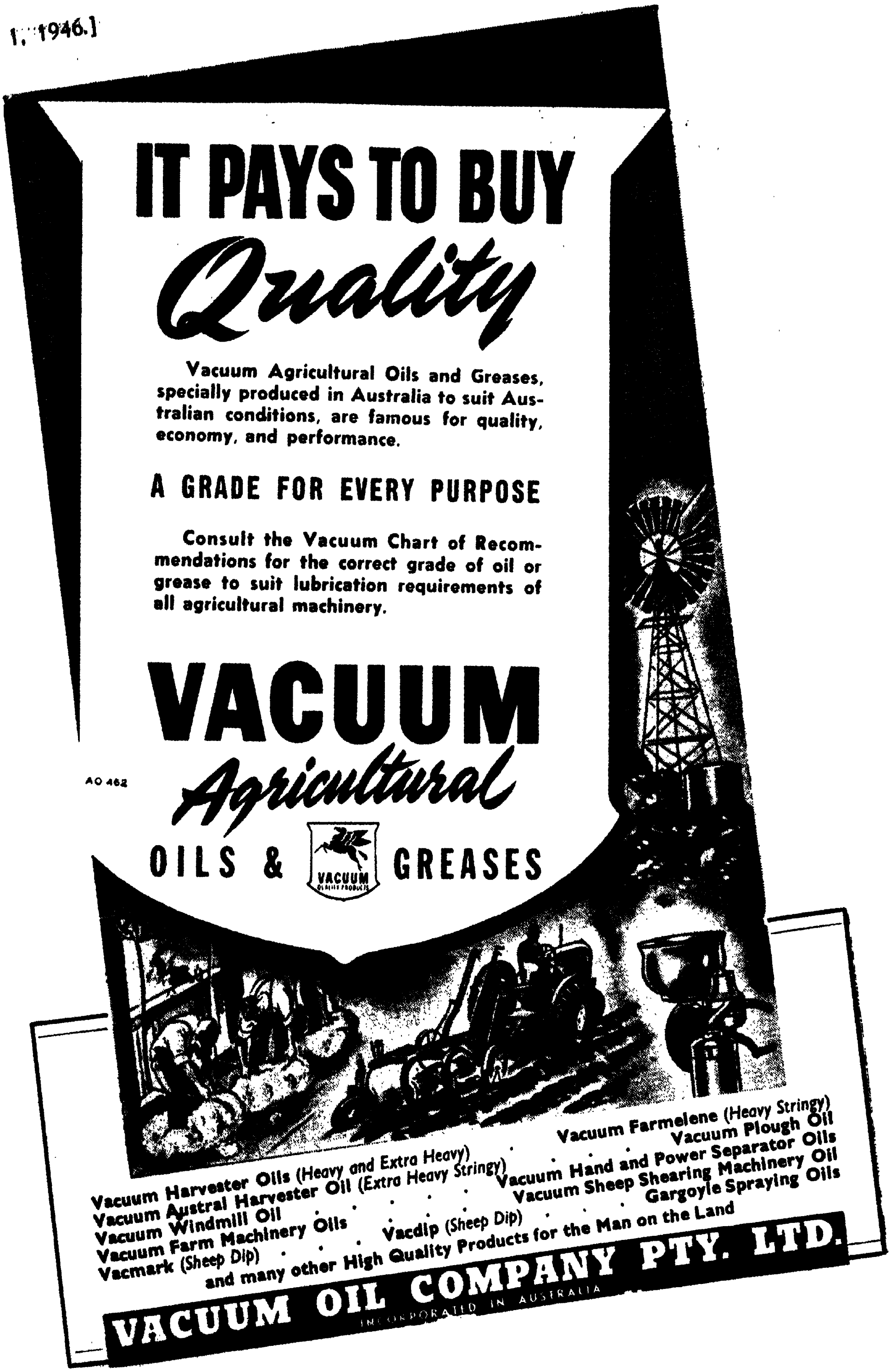
"The demobilisation of the fighting services means that a large pool of organised man power available for fire-fighting purposes, which has existed for the past six years, is fast disappearing," said Mr. Baddeley. "This will call for improved organisation in the local services, and fire-fighting authorities were advised some months ago of the need for recruiting new personnel and strengthening their organisation generally."

The Minister said that special protective measures for the forthcoming season were now being examined in conjunction with proposed legislation dealing with bush fires.

Permit for Lighting Fires Now Necessary.

As a result of a notification issued recently by the Minister, persons desirous of lighting fires for clearing land or for any similar purpose are required to obtain a permit.

Persons outside fire districts controlled by the Board of Fire Commissioners should obtain permits from the local shire or municipal council. In fire districts the officer or fireman in charge of the local fire station should be consulted.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INSECT PESTS.

Notes contributed by the Entomological branch

The Cabbage Moth *(Plutella maculipennis)*.

THE caterpillars or grubs of this moth are well-known pests of cabbages and cauliflowers, but they may also cause serious damage to the foliage of other plants belonging to the family *Cruciferae*, such as Brussels sprouts, kohl-rabi, radish, turnips, mustard, sweet alyssum, garden stocks, wallflowers, etc.

The adult is a small moth which measures about ⅜ inch in length. It is of a greyish-brown colour and when at rest, with folded wings, shows a row of angular, yellowish markings down the centre of its back. Abroad it is often known as the diamond-back cabbage moth.

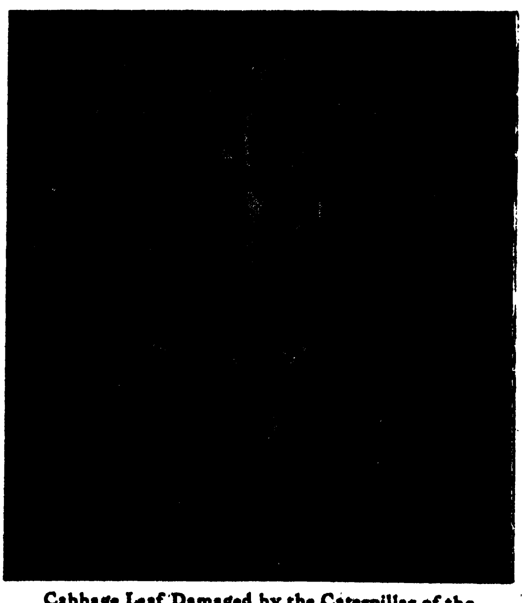
The minute disc-shaped eggs, which are pale green or yellowish, are usually laid singly, generally on the under-surfaces of the leaves. The young grubs, for the first two or three days after hatching, eat small pieces from the leaf-surfaces or else burrow into the leaves in the same manner as leaf-miners. They grow rapidly, become bright green in colour and eat out large pieces of the leaves. The outer leaves become perforated, but as the plants grow older the caterpillars feed mainly on the more tender centre leaves. Where the infestation is severe and control measures are neglected, the centre leaves of the plants become covered with fine webbing, and the hearts eaten through and fouled with excrement, the whole plant being rendered unfit for human consumption.

The fully-fed caterpillar, which measures about ½ inch in length, is very active, and when disturbed wriggles quickly away, drops to the ground or hangs suspended by a silken strand beneath a leaf. It eventually spins a flimsy, lace-like cocoon, usually on the under-surface of one of the leaves or amongst the heart leaves, and within this cocoon enters its pupal or chrysalis stage. The pupa is green at first but becomes brown before the adult emerges.

The incubation period of the eggs varies from three to six days; the larval period occupies from nine to twenty-eight days, and the pupal period from five to thirteen days. The complete life-cycle from egg to adult thus varies from seventeen to forty-seven days.

Control.

Clean cultivation is an important factor in the control of most crop and garden pests, and attention, therefore, should be given to old seed-beds which are likely to harbour the moths, and, later in the season, all cabbage and cauliflower butts and unsaleable plants remaining after cutting, should be cleaned up to prevent this pest from breeding and infesting later crops.



Cabbage Leaf Damaged by the Caterpillar of the Cabbage Moth.
The caterpillars and their cocoons are to be seen on the leaf.
(Reduced about half actual size.)

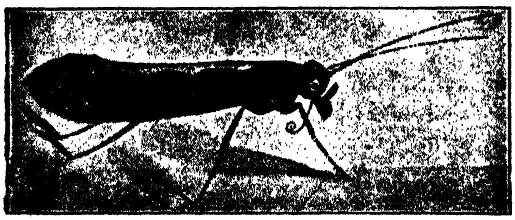
In New South Wales, the use of lead arsenate and derris dusts, by growers, is a routine practice in most districts for the control of this moth.

For cabbages, cauliflowers and Brussels sprouts, both in the seed-bed and after transplanting, the dusts recommended are:—

Lead arsenate dust 50 per cent. (lead arsenate powder 1 lb., kaolin 1 lb.); and derris dust (pure derris powder 1 lb., kaolin or talc 8 lb.).

Where lead arsenate is used the plants should be dusted every seven days while in the seed-bed and after planting out, every seven to fourteen days according to the amount of infestation. Derris dust is applied every seven to ten days. The applications are made at the rate of:—


The Caterpillar or Grub of the Cabbage Moth.


The Cabbage Moth showing the Diamond-shaped Markings on the Back.

Lead arsenate dust 15 lb., and derris dust 20 lb. per acre.

To avoid the danger of the hearts carrying undesirable arsenical residues from late applications of lead arsenate, *treatment with lead arsenate must cease about six weeks before cutting commences and derris dust be used instead.*

Cauliflowers must not be treated with arsenicals after the leaves covering the curd commence to unfold and the curd becomes exposed.

The Regulations under the Pure Food Act, 1908, prescribe a maximum arsenical residue of 1.4 parts per million, or 0.01 grains per pound.

Where crops such as turnips, radishes, etc., are attacked, either of the above dusts may be used to control the caterpillars, but here again, *lead arsenate should not be used where there is danger of contaminating portions of the plants that may be used for human consumption or for stock food.*

If ornamental garden plants are attacked, a lead arsenate dust or derris dust, or a lead arsenate spray (lead arsenate powder 1 oz., water 2 gallons) may be used to control the caterpillars. Spraying plants with leaf-surfaces such as cabbages is not recommended, as there is excessive "run off" of the liquid.

The dusts should be applied with some type of dust gun, or other mechanical equipment, in order to obtain an efficient covering of the plants with the insecticide. Derris should be stored in airtight tins or bags, as its toxic ingredients are affected by exposure to air and light.

It will often be found that, in addition to caterpillars, either green aphids (*Myzus persicae*) or slaty-grey aphids (*Brevicoryne brassicae*), are infesting the plants, and as these insects feed by sucking the sap, a contact insecticide is necessary to control them.

Where the derris-kaolin dust is being used for control of the cabbage moth, it should not be necessary to treat the plants for green aphids, as this dust is effective in controlling them. Derris dust, however, is not effective in controlling the slaty-grey aphids.

If the slaty-grey aphids are infesting the plants it will be necessary to use a 2½ per cent. nicotine dust (nicotine sulphate 40 per cent. 1 lb., hydrated lime 16 lb.) for their control. It is preferable to apply this as a separate dust in between the applications of lead arsenate or derris dust.

Some growers, in an effort to avoid an extra dusting, combine the nicotine with the lead arsenate dust, and substitute the lime as a carrier or filler instead of the kaolin. When this is done, although the lime renders the nicotine more effective, it makes the lead arsenate less efficient, and thus may result in inefficient control of the caterpillars. The substitution of kaolin as a carrier for nicotine also cannot be recommended.

The nicotine dust will control both the green aphids and the slaty-grey aphids.

The Use of D.D.T.

In recent experiments, for the control of cabbage moth caterpillars, very promising results have been obtained with D.D.T. dusts. The dusts were used at concentrations of ½, 1 and 2 per cent. D.D.T., and the applications were made at about twelve day intervals. The dusts were applied at the rate of about 40 lb. per acre.

Cabbages used in the above experiments treated with 2 per cent. D.D.T. dusts were fed to various animals for limited periods without evidence of ill-effects, and cabbages treated with ½ and 1 per cent. D.D.T. dusts were eaten by a number of persons without any apparent ill-effects, but the results of these tests are not conclusive.

The slaty-grey aphids appeared to be less susceptible to the action of D.D.T. dust than to sprays of the same chemical.

The Use of Power Machines.

In some districts power dusters have been used to treat cabbage crops. These machines are capable of covering about twice the acreage per nozzle than is possible with a knapsack duster in the same time. A machine that is capable of dusting four rows of plants at a time can treat 8 acres while one acre is being dusted by one man with hand equipment.

Where power machines are used it is important that the ground first be levelled or graded and that the rows of cabbages be evenly spaced to suit the particular type of machine to be used.

It is important, also, that the dusting should be commenced early in the growth of the crop. Where infestation of the centres of the plants has already occurred, it is essential, first, to treat the plants thoroughly with hand dusters before commencing with machines.

It frequently happens that some plants in the rows become more heavily infested with grubs than others, and it is then necessary to "spot dust" these plants with a knapsack duster, as it is not possible to give individual attention to plants with machines.

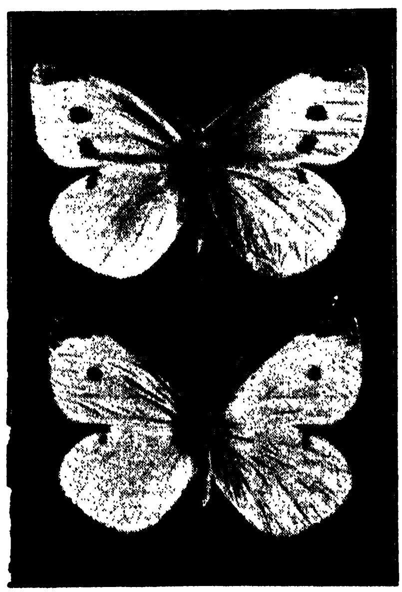
The Cabbage White Butterfly (*Pieris rapae*).

THIS butterfly now occurs in widely separated areas of this State, and its larvae feed upon various plants belonging to the family *Cruciferae*. Two other plants that may also serve as food for the caterpillars are mignonette (*Reseda odorata*, family *Resedaceae*) and the garden nasturtium (*Tropaeolum majus*, family *Geraniaceae*). These butterflies are frequently seen hovering over the blossoms of a great variety of plants in search of nectar.

The adult has a wing-expanse of about 2 inches and the ends of the forewings are marked with black or grey. The female has two black spots on each forewing and one at the front margin of each hindwing. The male, which is somewhat smaller, has only a single spot on each forewing and one on each hindwing. These small spots may be reduced in size and at times may be almost absent.

Although referred to, popularly, as a "white" butterfly, the adult is usually of a general light-grey or yellowish tint above, while beneath, the hindwings are distinctly yellow and the forewings somewhat paler.

The spindle-shaped eggs, which are pale yellowish in colour, are laid singly, usually on the undersides of the outer leaves of the food-plants.



The Cabbage White Butterfly.
Above: **Female.** *Below:* **Male.**

The caterpillar which, when fully-fed, measures about 1¼ inches in length, is velvety-green with a faint yellowish stripe down the back and along each side. Its body is covered with fine hairs and minute black protuberances. The colour of the caterpillar closely resembles that of the plant on which it is feeding, and as it frequently rests with its body extended along the mid-rib of a leaf, it is not readily noticed, but the large irregular holes which appear in the leaves where it is feeding, soon indicate its presence.

The pupa or chrysalis, which measures slightly more than ½ inch in length, varies in colour and may be various shades of grey, yellow or green. It is attached by its tail to a silken pad, and its body is supported by a fine, silken girdle around the middle. The pupa may be attached to a food-plant or to some object nearby, or even to debris on the ground.

Two generations are known to occur in a year.

Control.

The measures recommended for control of the cabbage moth caterpillars are equally effective in controlling the caterpillars of this butterfly, and the D.D.T. dusts mentioned previously have also been found effective in its control.

Research on Soil Organic Matter.

MR. R. J. SWABY, Bacteriologist of the Biological Branch of the Department of Agriculture, who was recently awarded a Ben Fuller Travelling Scholarship, is sailing for England to undertake studies under Dr. H. G. Thornton at the Rothamsted Experimental Station.

Mr. Swaby's studies at Rothamsted would be in the nature of an extension of his work on the role of organic matter in plant nutrition and soil structure, on which he had specialised for some years, said the Minister for Agriculture (Hon. E. H. Graham), in announcing Mr. Swaby's departure. He had worked chiefly on the effect of soil microflora on rate of humus formation and decomposition, and the effect of these factors on the physical structure of soils from various districts of the State. In England he would continue his studies in soil microbiology, and hoped to study the relative merits of composting, stubble mulching, green manuring, rotational cropping and ley farming for restoring the humus and crumb structure of depleted soils.

"These further researches should be of very definite benefit to our farmers," observed Mr. Graham. "The role of organic matter in relation to soil fertility is a subject of vital importance, and a good deal of publicity, not all of it accurate, has been given to it here and abroad in recent years. Mr. Swaby is particularly qualified for these investigations, and with his special knowledge of Australian soils will no doubt contribute usefully to soil science at Rothamsted as well as benefiting from his experience there."

A graduate of Melbourne University, holding the M.Sc. degree, Mr. Swaby was associated during the war with important researches in the production of organic acids, which threatened to be in short supply.

He will remain two years in England, when it is hoped that he will be able to return via the United States, making contact with soil microbiologists in that country.

Soil Erosion.

Preventive Effect of Pastures.

VEGETATION (pasture sward) reduces erosion in three ways:—

1. Humus or organic matter derived from the pasture (particularly from the clover or legume portion) acts as a source, and thus water absorption by the soil is facilitated.

2. The leafage and stems act as a canopy, and thus prevent water beating down on to the surface soil, and not only destroying the physical condition of the soil and therefore reducing its absorptive capacity, but churning the soil particles into a muddy suspension in the water, so that they are readily carried away in the run off. The run off from a ploughed paddock or sparsely covered pasture land is turbid, whereas that from an area covered by a dense pasture sward is practically always quite clear.

3. Roots of plants act as binders and so help to hold soil particles together. In addition they help increase the absorptive capacity of soils. For example, Subterranean clover is an annual and dies off with the advent of hot weather in summer. The roots of the plant decay *in situ*, thus forming small channels throughout the soil and so enabling water to penetrate more freely and to greater depths.

FRUIT GROWING.

PRUNING BEARING CITRUS TREES.

R. J. BENTON,
Special Fruit Instructor.

GENERALLY the less pruning that bearing orange, grapefruit and mandarin trees receive, the more satisfactorily will they grow. Pruning may be necessary, however, (a) to improve the form or shape of the tree; (b) rejuvenate a weak condition; (c) to regulate bearing.

All citrus varieties may require a little attention to improve shape, though most citrus trees will develop satisfactorily if unpruned subsequent to hard cutting at planting time. The only likely attention that will be necessary on very vigorous trees may be a slight lifting or skirting of limbs and suppression of strong growth emanating from the trunk or near the crown of the tree, and which are not needed to improve the shape.

Pruning in regard to rejuvenation is applicable to all kinds of citrus trees, which for some reason have declined in vigour. Before pruning is attempted, however, the cause of the unthrifty conditions should be rectified, for without removal of the cause, pruning may accentuate the unsatisfactory condition.

Pruning to regulate production is only necessary with certain varieties which tend to crop in alternate years—such as Thorny and Beauty of Glen Retreat mandarins and Wheeny grapefruit, each of which tends to bear heavily in alternate years.

Pruning will, therefore, vary with the need for this operation.

An Unthrifty Orange Tree Severely Thinned by Pruning.

To improve the shape of the tree necessitates removal of any erect-growing limbs arising from or through tree centres, mostly in trees up to bearing stage, and shortening back to more erect growths limbs that are too drooping.

Pruning to rejuvenate condition demands a reduction of the leaf-bearing area, to ensure that much greater growth or vigour will result from the portion of tree top retained. If all the growth is weak on the trees, it should all be removed from the principal limbs and the opportunity taken to improve the spacing of the principal limbs retained. These limbs should then be shortened back moderately, or severely, as indicated by previous tree condition. A good rule to follow is to err on the side of hard pruning. First, select the principal limbs or skeleton, ensuring that all limbs retained are as well spaced as possible and do not crowd or cross one another. Next, remove all side growths from the limbs retained. Then shorten back the limbs lightly or severely. In localities where brown spot occurs, susceptible varieties, such as Emperor mandarin, should never be severely shortened back.

Pruning to regulate bearing requires removal of portion of the leafy twigs or laterals, usually to the extent of one-third of the tree foliage. This is best done by thinning out laterals along the main limbs.

Should lemon trees which have produced well show any weak laterals or spurs which have become leafless or almost so, they should be shortened back more or less severely.

The Time to Prune.

The most re-invigorating result from pruning occurs if the operation is performed in early spring commencing about the end of frosty conditions. With normal conditions prevailing, pruning may be continued for about two months, after which time there is a less vigorous result.

Very little experimental work with citrus pruning has been done in this country, but it is very obvious from many observations made on the effects of bush fires occurring at various periods in summer, also from results of reworking trees and the severe thinning of growths not required, and further confirmed by nursery work, that pruning is progressively weakening on tree vigour, from early spring onward through summer to winter. The time to prune for regulation of production is, therefore, early spring only, up to and including the time of blossoming, and then only on trees which promise to yield heavily during that year.

Pruning for shape may be done at any time of the year and preferably as soon as the need is apparent. If the removal of dead and spent wood only is the objective, this operation may be undertaken at any period of the year.

APPLE GROWING IN NEW SOUTH WALES.

(*Continued from page* 479.)

H. BROADFOOT, Chief Fruit Instructor, and E. C. WHITTAKER, Fruit Instructor.

THIS is the third section of this article, which commenced in August issue. To date the authors have dealt with districts and soils suitable for apple growing, and with preparations for planting. This section deals with varieties and with inter-pollination.

VARIETIES OF APPLES.

Recommendations for Various Districts in New South Wales.

In the early days of the industry in New South Wales, it was the accepted practice to plant a considerable number of varieties in the one orchard, mainly with the idea of providing for an extension of the harvesting and marketing season over as long a period as possible.

With the advent of cool storage in the various centres, and a more precise knowledge of the behaviour of the different varieties under the varying climatic and soil conditions of the State, together with experience regarding the consumers' preferences, both in regard to the local and overseas trade, it has become very obvious that only a very limited number of all the hundreds of apple varieties available, are worth a place in a commercial orchard.

At the present time apple varieties grown commercially are, to a large extent, standardised. Apple growers can learn the value of standardisation from the producers of manufactured articles. Consumers learn to ask for well-known makes or brands which have served them well in the past and gained their confidence, and much the same thing applies to well-known and dependale varieties of applies.

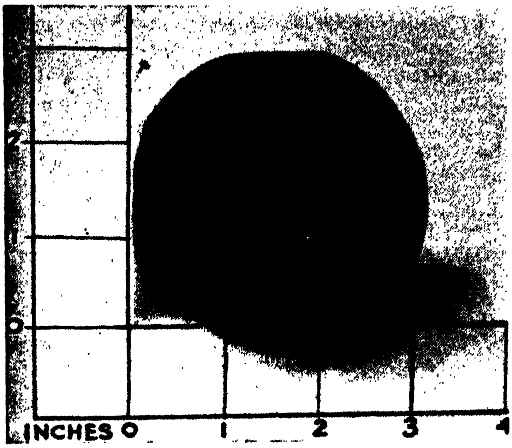
There is no reason to imagine, however, that the last word on apple varieties has been said; quite the contrary, as the search for better varieties is constantly going on; but it is emphasised that the limited number of varieties now grown commercially can, with the aid of up-to-date cool storage meet all demands of the local and export markets, and any new variety which can displace the present top-ranking varieties on the market will, indeed, be a world-beater.

A grower, therefore, who plants any quantity of other than the recommended varieties is taking a risk which experience has shown to be very unwise.

The list of recommended varieties given in this article represents a recent expression of opinion from all interests in the apple-growing industry, and is based on many years of growing and marketing experience, of experiments and of observations.

It is realised, of course, that such a list, because of the lapse of time between planting and production, is somewhat in the

nature of a forecast, and therefore subject to happenings in the future which cannot be predicted. This, however, should only serve to emphasise the need for making use of the best and most up-to-date knowledge of varieties available.



Granny Smith Apple.

In addition to listing the best commercial varieties, the recommendations take into account the district or districts of the State in which each variety can be grown and marketed profitably. Some varieties demand even more than this, as a few of them are particularly selective as to site and soil, and give maximum return only when planted on selected areas in the districts which suit them.

Provision for adequate pollination should be made where only one variety is recommended, and in districts in which the varieties listed are inter-sterile.

Late and Mid-season Varieties.*

The districts mentioned supply the bulk of the mid-season late apples for local and export markets.

Batlow.—Granny Smith, Jonathan, Delicious, Lalla, Democrat, Crofton, Dougherty and Stayman.

Orange.—Granny Smith, Jonathan, Delicious, Lalla, Democrat, Crofton, Rome Beauty. Crofton in Canoblas and Pinnacle Road areas only.

Kentucky.—Granny Smith, Jonathan, Delicious, Lalla.

Uralla.—Granny Smith, Jonathan, Delicious, Lalla.

Arding.—Granny Smith, Jonathan, Delicious, Lalla.

Armidale.—Granny Smith, Jonathan, Delicious, Lalla.

Early Granny Smith Districts (Inland).

Only one variety, Granny Smith (for the early market), is advised for these areas.

Murrumbidgee Irrigation Area.—Granny Smith.

Dubbo.—Granny Smith.

Forbes.—Granny Smith.

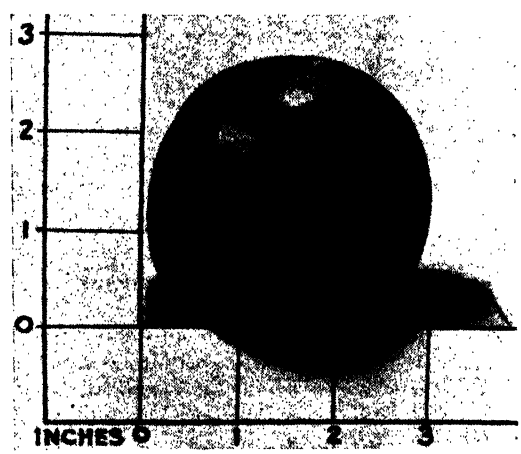
Early Varieties in Early Districts.

Early cooking and dessert applies from these districts meet most of the demands of the early market, and take a definite place in the State's apple marketing programme.

Oakdale.—Alfriston, Twenty Ounce, Early McIntosh, McIntosh Red, Gravenstein, Granny Smith, Jonathan.

Camden.—Alfriston, Twenty Ounce, Willie Sharp, Early McIntosh, McIntosh Red, Granny Smith.

Coastal and Hills District.—Early McIntosh, Carrington, Allsopps, Willie Sharp, Kirks, Cowells Red, Mobbs Royal, Alfriston, Twenty Ounce.



Jonathan Apple.

Descriptions of Varieties.

Granny Smith.—The adaptability of this variety, a New South Wales seedling, to varying conditions of soil and climate has led to its commercial planting in all kinds

* In districts in which both Delicious and Lalla have been recommended, the Delicious variety should always be planted in preference to Lalla, provided the soil is suitable.

of suitable and unsuitable places. It lives up to its reputation as an inherently consistent cropper and produces good apples under almost incredible conditions. An apple which can produce early cookers from semi-arid inland areas under irrigation and a long storage dessert apple from the tablelands is certainly versatile. The question to which the commercial grower requires an answer is "Where can it be grown most profitably?" Experience has now shown that answer to be "In the good apple districts."

In common storage it keeps well for a moderately long period, and when correctly handled has a long cold storage and after-storage life. Except when the fruits are to be sold as early cookers, picking Granny Smith at the correct stage of maturity is particularly important. Cold storage disorders frequently follow picking when immature; over-maturity at picking and over-long common storage result in a loss of its green colour. The wholesale and retail sections of the fruit trade are keenly alive to the fact that a yellow Granny Smith is approaching the end of its storage life.

The variety is deservedly popular on our own and overseas markets.

Jonathan.—Jonathan is an attractive striped red to deep red dessert apple, medium early in season and with an excellent, probably unbeaten record for consistent cropping.

Although it has a wide tolerance for varying types of soil, it returns the greatest profit in the proper apple environment. Hot, dry districts do not suit it, and even with irrigation in these climates, the quality is poor.

The common storage life is comparatively short, but both small and large sizes keep well if promptly cool stored—the small better than the large, and the latter have a short after-storage life. The fruit withers badly if picked too early, and breaks down quickly if a little too mature.

This is a very popular and well-known variety on our own market.

Delicious.—When well-grown and properly handled, Delicious is a high quality, finely flavoured apple; it is striped to solid red in colour.

The successful production of Delicious demands more than a classification of the State into districts. There is certainly little prospect of doing well with it outside the good apple districts, and it is in favoured localities in these districts that it yields most profitably. It is very discriminating as to soils, rainfall, temperature and altitude, and has less ability to set and hold a crop under adverse conditions than either Granny Smith or Jonathan. Cropping is greatly reduced if the tree becomes "staggy" from any cause.

It is inclined to be an alternate cropper.

The picking period is short and the common storage life comparatively short, but all sizes keep well if promptly placed in cool storage.

New South Wales Delicious are very well and favourably known to consumers.

Lalla.—A highly coloured "sport" from Delicious, Lalla retains the growth and fruiting characteristics of the parent variety. Its handling and storage qualities, too, are similar to Delicious.

The only circumstance under which there is a good reason for replacing Delicious with Lalla, is on soils in the good apple districts where Delicious colouring is not quite satisfactory. Where Delicious fails in unfavourable climatic zones, Lalla will also fail.

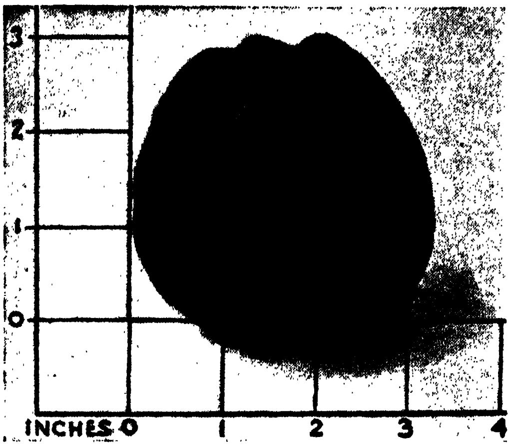
Democrat.—A solid red apple which keeps very well in common, cold and after-storage. Although not an apple of high-eating quality, it is a good commercial variety when grown where soil, rainfall, temperature and altitude suit it. It supplies the trade with a red apple after long cold storage and at a time when few other red apples are available. Its chief disability from a commercial growing viewpoint is its very pronounced tendency to "staggy" growth and alternate crops as the tree ages.

There will be some reason for satisfaction when a late keeping red apple of better quality than Democrat is available to take its place in New South Wales.

Rome Beauty.—Rome Beauty is a coloured dessert apple, usually large in size, with a good appearance and of good quality. The fruit holds well on the trees. This variety does well in only a few districts, and it is fairly popular on our own market.

It presents pruning problems which are peculiar to the variety, being difficult to shape and producing laterals sparsely.

Because of the large proportion of big fruit (only the small sizes cool store quite satisfactorily) and the great variation in its colour and quality in different districts, it is not a suitable variety for general export.



Delicious Apple.

McIntosh Red.—Good flavour and flesh texture with a crimson flush are included in the qualities which make McIntosh Red a good, medium-early, dessert apple.

The use of hormone sprays to overcome pre-harvest drop before the full development of colour offers prospects of marketing this variety in its most attractive condition.

Attempts to extend marketing after its condition has deteriorated or to grow it in late districts are inadvisable.

In the Oakdale district, where it is the leading variety, it grows to perfection.

Gravenstein.—The beneficial effects of plant hormone sprays for preventing pre-harvest drop apply also to Gravenstein, which also falls readily.

The fruit is usually above medium size, yellow in colour, streaked and dotted with crimson. It keeps well in common storage for an early apple and is popular on our own market.

Crofton.—In selected localities on good soils at Batlow and Orange, this variety produces a late-keeping, red dessert apple of high quality. Unfortunately, tree growth is not vigorous and becomes spindly on poorer soils.

The flesh is firm, not easily bruised and is crisp and sweet. The variety keeps well in cool storage for a long period.

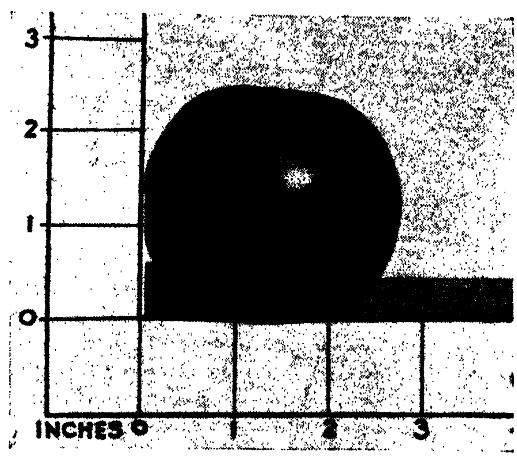
Dougherty.—This variety does well at Batlow, is a vigorous and upright grower and produces a sweet dessert apple of dull red colour and with a good flavour. It holds fairly well in cool storage.

New Varieties from "Sports" and Chance Seedlings.

In common with many other kinds of fruit, the apple will occasionally produce on a certain twig or spur fruit which differs from that in the remainder of the tree.

These "sports," as they are called, are the result of a botanical phenomenon known as bud mutation, and in some cases it has been found possible to perpetuate the type by using buds from the particular twig or spur which bore the "sport."

However, all "sports" are not necessarily an improvement on the original variety from which they came, and, in fact, they may very easily be inferior in one or more vital characteristics. In attempts to grow apples in hot or otherwise unsuitable localities there has been, in the past, a tendency



Rome Beauty Apple.

to plant "sports," particularly highly-coloured "sports," of well-known varieties in the hope that they will produce well-coloured apples in spite of the adverse conditions.

The result may be, if we are not careful, that new varieties will appear on the market from time to time, the only advantage of which is a slightly better colour than the original, whereas other characteristics such as keeping quality, dessert quality, etc., may

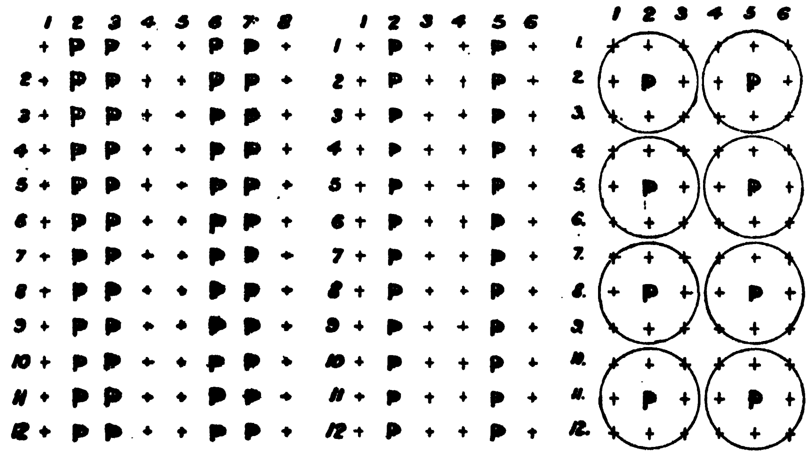
be inferior. By the association of names, a good deal of harm may be done to the reputation in the markets of established varieties.

There is a grave danger also in the indiscriminate introduction of chance seedlings, since many seedlings closely resemble one or other of the parent varieties outwardly, but again as with bud "sports," may be very inferior in other qualities. This is exemplified very well in the case of "Delicious." During the past few years, various varieties, such as Orleans, Medina and Rainier, all purporting to be improvements on Delicious have made their appearance in nurserymen's catalogues, but although they closely resemble this valuable dessert variety in shape and colouring, they cannot compare with this variety in dessert quality.

To-day the relatively small number of varieties recommended for general commercial growing necessitates careful consideration of the matter when planting to ensure that the cross-fertilisation needs of the trees are met as fully as possible.

The value of cross-pollination between varieties is now generally recognised, and the intending grower is strongly urged to study carefully the accompanying diagram before planting, or even ordering his trees from the nursery. Most varieties of apples are self-sterile up to a point, but nevertheless, to obtain good and consistent crop, it is invariably sound policy for the grower to assume that they are self-sterile, as it has been proved on numberless occasions that, even in the case of highly self-fertile varieties, cross-pollination is advantageous in the

Diagram showing Suitable Distribution of Pollenizers.
A.—Suitable when two or more interfertile varieties are required in equal proportion.
B.—Suitable when one or more of the interfertile varieties is required in the proportion of two to one.
C.—Suitable when a minimum number of a pollenizer is required, all trees being in direct contact with the pollenizer.



A B C

long run. Unpredictable factors such as weather conditions play a large part in the process of fertilisation, hence it behoves a grower to leave as little as he can to chance.

However, it occasionally happens that a "sport" or a chance seedling does show definite promise of being an acquisition to the industry, and such new types should not be ignored. The Division of Horticulture of the Department of Agriculture is always willing to test such varieties under comparable conditions with the standard varieties now grown and thereby save the grower and the industry much expense and trouble.

Inter-pollination of Apples.

In the early days of apple growing in this State when many varieties were planted in order to spread the work of harvesting and marketing over as long a period as possible, the inter-pollination of varieties was taken care of automatically.

It is accepted that varieties should be planted as near as possible to each other for the best results from cross-pollination, consistent, of course, with ease and economy or working, but having done this and then leaving the distribution of pollen to chance is not in keeping with careful planning. It has been estimated that the ordinary honey bee is responsible for from 90 to 95 per cent. of the cross-fertilisation work amongst fruit trees; hence every grower should make an effort to keep at least a few hives of bees near the orchard—even if only for their value as agents of pollination.

(To be continued.)

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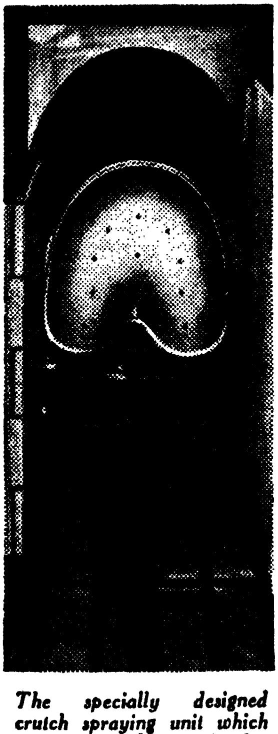

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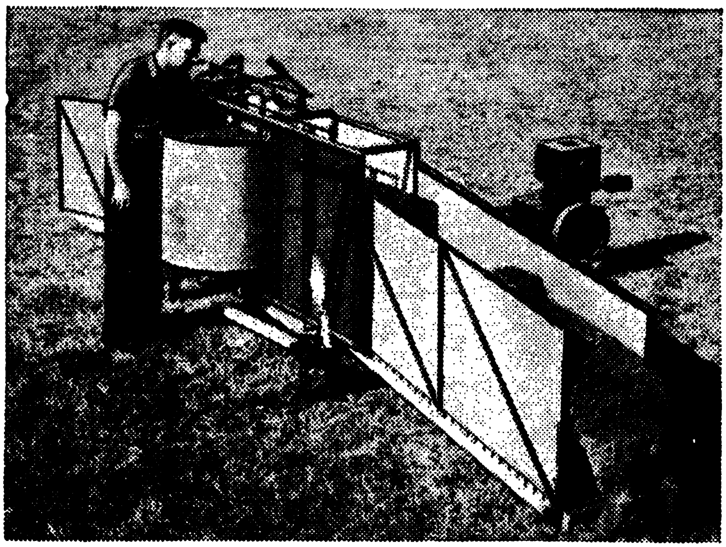

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CODLING MOTH CONTROL.

Experiments at Bathurst using D.D.T.,[1] "666"[2] and Lead Arsenate.

G. PASFIELD, B.Sc.Agr., Assistant Entomologist, and J. D. BRYDEN, Senior Orchardist.

THERE was a very heavy codling moth (*Cydia pomonella*) infestation of apples in the Bathurst district during the 1945-46 season, and in an experiment conducted at Bathurst Experiment Farm during that season, using Granny Smith apple trees, the infestation of fruits sprayed with 0.1 per cent. D.D.T., lead arsenate and 0.1 per cent. "666" was 14.8 per cent., 36.6 per cent. and 84.0 per cent. respectively.

Over 80 per cent. of infested fruits from the "666" plots had been entered through the calyx.

Analysis of the results (using inverse sine transformation) by comparing the percentages of infested fruits, revealed a significantly lower infestation in the D.D.T. plots than in the lead arsenate plots, and also a significantly lower infestation in the lead arsenate plots than in the "666" plots.

Trees sprayed with D.D.T. became heavily infested with red mites (*Bryobia praetiosa*) during the experiment, but no infestation occurred in lead arsenate- and "666"-sprayed trees.

Details of the Experiment.

The objects of the experiment were to determine:—

1. The relative efficiences of D.D.T., "666" and lead arsenate sprays in controlling codling moth.
2. The present degree of control obtainable with the lead arsenate spray schedule.
3. The effect of D.D.T. and "666" on other pests often found on apple trees.
4. The phytotoxic effect of D.D.T. and "666" sprays.

Thirty Granny Smith trees were used and the three treatments were arranged in ten randomised blocks, each plot containing one tree. A buffer plot was left between each treatment plot. The trees in four of the blocks were thirteen years old and the rest, fourteen years old.

The treatments employed were:—

A. 0.1 per cent. D.D.T.-solvent naphtha-wetting agent emulsion.

B. 0.1 per cent. "666"-mayonnaise emulsion.

C. Lead arsenate schedule.

All the buffer trees were sprayed with treatment C.

The apples were harvested on 24th April.

[1] Dichlorodiphenyltrichlorethane (95 per cent. para para isomer).

[2] Benzene hexachloride (13 per cent. gamma isomer).

Lead Arsenate Spray Schedule.

The calyx and first cover spray consisted of 3½ lb. lead arsenate, 1 lb. casein-lime to 100 gallons of water. In the second and third cover sprays, 3½ lb. lead arsenate (in which a spreader was incorporated) to 100 gallons of water, were used, and in the rest of the cover sprays the formula was 3 lb. lead arsenate, ½ lb. casein-lime to 100 gallons water. To the above schedule, 2 gallons of lime-sulphur were added to the calyx spray, 1 pint nicotine sulphate to the first, fourth and sixth cover sprays, and 1 gallon of white oil to the second cover spray. The average amounts of spray used per tree per application were:—

Lead arsenate—2¼ to 3½ gallons.

"666"—1 4/5 gallons.

D.D.T.—2½ gallons.

Each tree in the three treatments received an approximately similar coverage.

The sprays were applied from two power sprayers (one for treatment A and one for treatments B and C) at a pressure of approximately 350 lb. per square inch at the pump, using 2 feet rods with single, angled nozzles, with a disc aperture of 3/32 inch.

Dates of Application.

The single calyx and seven cover sprays were applied to the trees on 22nd October, 2nd and 16th November, 4th and 27th December, 21st January, 11th February and 8th March respectively.

Orchard Sanitation.

The forks and trunks of the trees were scraped at pruning time and the over-wintering larvae destroyed.

Hessian bandages were used for taking larval counts.

Picking off of infested fruits, picking up of windfalls under all trees and counts of larvae were carried out regularly and recorded.

Seasonal Conditions.

The rainfall recorded during the experiment was below normal. In October, 114 points of rain fell on four days; November, 128 points on four days; December, 170 points on four days; January, 227 points on seven days; February, 165 points on nine days; and in March, 122 points on six days.

Lack of moisture became noticeable as summer temperature increased normally and, while these conditions were temporarily relieved by good rains received in early January, 1946, drought conditions became pronounced during February and March.

Observations.

A medium infestation of thrips (*Thrips imaginis*) appeared on the blossoms in October.

The peaks of emergence of moths, estimated from the bandage counts, occurred in the first week of December and the third week of January.

The D.D.T. sprays had very superior spreading qualities to those of the lead arsenate and "666" sprays. Small deposits of a yellow, greasy, amorphous material were found in the bottom of the spray vat after spraying with "666." No deposits were observed in the spray vats after spraying with D.D.T. and lead arsenate.

Following the calyx spraying, most of the trees used for the experiment were closely examined. No insects could be seen on D.D.T.-sprayed trees, although many and various insects (no codling moths) were found under them, displaying symptoms of D.D.T. poisoning. Insects were observed on trees sprayed with "666" and lead arsenate, although some affected insects were seen under those sprayed with "666." Examination of the trees at regular intervals during the experiment revealed an apparent absence of insects from D.D.T.-sprayed trees (codling moths must have laid their eggs in them), but this was not so with those receiving the other treatments.

A very heavy infestation of red mites (*Bryobia praetiosa*) was present on the leaves of D.D.T.-sprayed trees on 11th February. They were first observed on the leaves on 4th December and they had disappeared, after severely mottling the leaves, by 28th February. There was no infestation by this pest of lead arsenate- and "666"-sprayed trees.

On 27th November, isolated colonies of woolly aphids (*Eriosoma lanigerum*) appeared to be thriving on some D.D.T.-sprayed trees, but, as the experiment progressed, there was no abnormal increase in infestation.

The hessian bandages on three of the trees sprayed with "666" were stiff from soakings with the spray on 10th December, when the bandages were first examined, and no codlings moth larvae were found in them. The bandages on the other "666"-sprayed trees on which the bandages were not noticeably stiff from soakings contained larvae. Examination of all the bandages at later dates, when none appeared to be stiff, revealed larvae in all of them.

A small amount of burning was observed on the margins of the foliage on the western side of two D.D.T.-sprayed trees, but the remainder of the trees used in the experiment were not similarly affected. There was only a negligible amount of sunscald on the fruits of any of the trees sprayed with any of the three treatments used. The fruits of trees sprayed with D.D.T. had a better appearance (being generally clean, bright and attractive) than those of trees sprayed with the other treatments.

The spray operator who applied the D.D.T. calyx spray suffered a headache and slight stomach disorder for about 24 hours following that spraying, and the other spray operator who applied the "666" calyx spray was affected with nausea for the same length of time. At subsequent applications of spray

both operators took more care to avoid inhalations of the spray and were not affected as with the calyx spray.

Ten mature codling moth larvae were placed on filter papers, each of which had been dipped in 0.1, 0.2, 0.5, 1.0 and 2.0 per cent. D.D.T.-mayonnaise emulsions for 2 minutes and allowed to dry, for periods of 1 and 4 hours. No mortality was recorded from any of the treatments.

D.D.T. Residues.

The average residue of D.D.T. on a sample of eighteen Granny Smith apples nine weeks after the last cover spray was applied was 11 parts per million.

Results.

The mean infestation and total number of larvae recovered from the bandages of each treatment are shown in Table 1.

In Table 2 the results from the individual plots are recorded.

TABLE 1.—PERCENTAGE MEAN INFESTATION AND TOTAL BANDAGE COUNTS.

Treatment.	Percentage Infestation.	Larvae in Bandages.
0·1 per cent. D.D.T. ...	14·8	264
0·1 per cent. 666	84·0	1,858
Standard Lead Arsenate Schedule	36·6	650

TABLE 2.—RESULTS FROM INDIVIDUAL PLOTS.

Block.	Treatment.	Total No. of Fruits.	No. of Infested Fruits.	No. of " Stung " Fruits.	Per cent. of Infested Fruits.	Per cent. of " Stung " Fruits.	Larvae on on Bandages.
1	0.1 per cent. D.D.T. ...	918	93	169	10.14	18.41	28
	0.1 per cent. 666 ...	316	280	12	88.61	3.80	110
	Lead arsenate	642	220	152	34.27	23.62	57
2	0.1 per cent. D.D.T. ...	603	75	118	12.44	19.57	16
	0.1 per cent. 666 ...	870	689	14	79.20	1.61	234
	Lead arsenate	718	330	90	45.96	12.53	70
3	0.1 per cent. D.D.T. ...	499	129	113	25.85	22.65	34
	0.1 per cent. 666 ...	906	707	20	78.03	2.21	224
	Lead arsenate	651	237	124	36.40	19.04	61
4	0.1 per cent. D.D.T. ...	937	123	120	13.13	12.80	26
	0.1 per cent. 666 ...	715	637	10	89.08	1.40	172
	Lead arsenate	1,113	372	258	33.43	23.18	74
5	0.1 per cent. D.D.T. ...	877	123	165	14.03	18.81	38
	0.1 per cent. 666 ...	563	432	17	76.74	3.02	91
	Lead arsenate	941	345	201	36.66	21.36	86
6	0.1 per cent. D.D.T. ...	572	109	127	19.05	22.20	29
	0.1 per cent. 666 ...	640	560	9	87.50	1.41	150
	Lead arsenate	916	392	154	42.80	16.81	57
7	0.1 per cent. D.D.T. ...	979	159	243	16.24	24.82	34
	0.1 per cent. 666 ...	1,085	902	12	83.12	1.11	256
	Lead arsenate	820	262	143	31.96	17.44	79
8	0.1 per cent. D.D.T. ...	860	123	153	14.30	17.79	20
	0.1 per cent. 666 ...	941	662	37	70.36	3.93	184
	Lead arsenate	885	214	163	24.18	18.42	41
9	0.1 per cent. D.D.T. ...	935	77	139	8.24	14.87	17
	0.1 per cent. 666 ...	957	896	45	93.63	4.70	238
	Lead arsenate	256	134	79	52.35	30.86	57
10	0.1 per cent. D.D.T. ...	793	117	175	14.75	22.07	22
	0.1 per cent. 666 ...	853	799	6	93.67	0.70	199
	Lead arsenate	1,038	290	173	27.95	16.66	68

Discussion.

At the Bathurst Experiment Farm all possible measures—including the dipping of boxes, the trapping of moths in the sheds, the careful inspection at pruning time of the forks, trunks and soil around the trunks of the trees, as well as the picking off of infested fruits and picking up of windfalls during the growing season—are taken to reduce the carry-over of codling moths each season, and yet the control by the lead arsenate spray schedule in the 1945-46 season was inefficient. It is generally held in the district that when the summer is very dry, as was the case this year, the lead arsenate spray schedule (which varies a little depending on the season) gives very poor results—and some even go so far as to say that the moth is uncontrollable.

It is possible that (*a*) the lead arsenate spray schedules are less effective than desirable; (*b*) the sprays are not properly timed; and/or (*c*) the spraying is faulty. The lastmentioned possibility can, on the whole, be discounted at Bathurst Experiment Farm. The first two possibilities may explain or partly explain the poor control under conditions such as mentioned above, even though every effort has been made to improve the methods of control at the Farm. Thus the present indications are that little hope can be held for improved codling moth control with lead arsenate sprays.

Is D.D.T. the answer to the codling moth control problem? Although the percentage infestation of fruit from trees sprayed with D.D.T. was comparatively high from an economic viewpoint, it was a measure of the degree of control which can be obtained in bad moth seasons, and proved D.D.T., at a concentration of 0.1 per cent., to be much more effiecient than the lead arsenate sprays. It is quite probable that the degree of efficiency of D.D.T. spraying in this experiment during a bad moth season will play a bigger part in progressively reducing the codling moth carry-over each season, than lead arsenate sprays have done in the past.

An examination of the results in Blocks 3 and 6 of Table 2 reveals a relatively large increase in percentage infestation of the trees with the lowest yields amongst those sprayed with D.D.T. Such increases in infestation of low yielding trees are normally expected with lead arsenate sprays, but at Orange, where similar experiments were carried out with a somewhat lighter moth infestation, this was not the case with D.D.T. sprays (*N.S.W. Agricultural Gazette, September,* 1946). However, the only other D.D.T.-sprayed tree at Bathurst (in Block 2) with lower than the average yield had less infestation than the mean percentage infestation. Of course, neither the results obtained in this experiment nor in those at Orange are conclusive, but they do indicate that this matter will be worth investigating because of its particular value in seasons of low yields.

The limiting factors to the use of D.D.T. for control of codling moth in pome fruit growing areas have been discussed in the September issue of the *Agricultural Gazette.* Until much more is learned about these factors, it will not be possible to make any recommendations concerning the value of D.D.T. for controlling the codling moth.

The toxic effect of the D.D.T. spray to the trees and their fruit was negligible in this experiment, as also was that of the "666" spray.

In this experiment, as at Orange, fruit from "666"-sprayed trees showed a very heavy entry of larvae through the calyx, as well as side entry, which indicates a lack of residual effect of "666" that is not of such importance in the relatively frequent cover sprays as in the calyx spray. Even though the results with "666" were extremely bad, it would be worth trying again, using a lead arsenate calyx spray followed by cover sprays of "666" in a water-dispersable form which might reveal its efficiency more accurately than the mayonnaise form, which was not very satisfactory.

The results of the small laboratory experiment in which mature codling moth larvae were subjected to concentrations of up to 2 per cent. D.D.T. for periods of 1 and 4 hours, do not indicate that D.D.T. will have any value as a trunk spray against hibernating larvae.

Acknowledgments.

We are indebted to Mr. F. C. McCleery, Biometrician, for analysis of the results, and to Mr. O'Neill of the Chemist's Branch, for the analysis of residue of D.D.T. on the apples.


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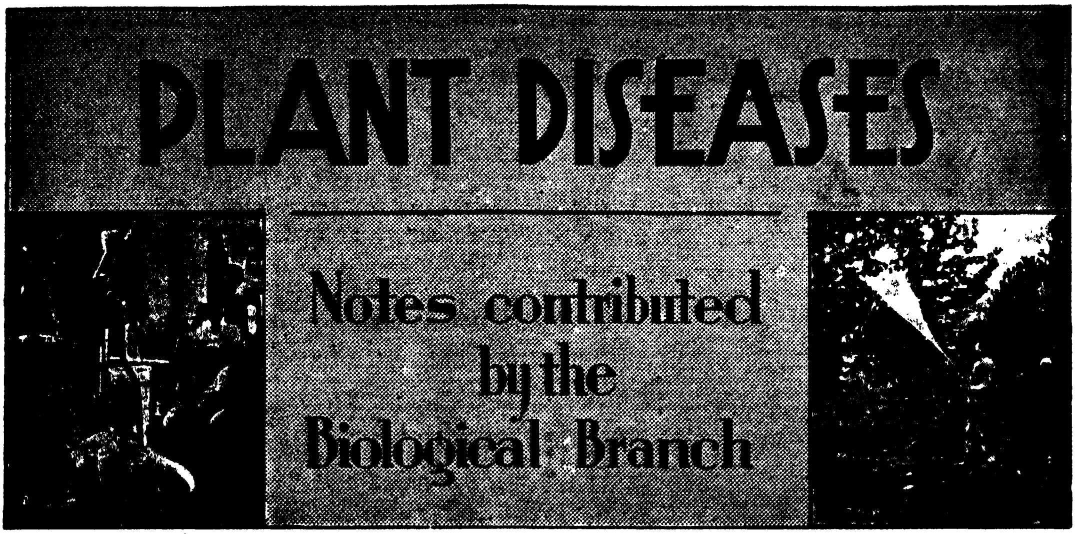


Eelworm Disease of Potatoes.

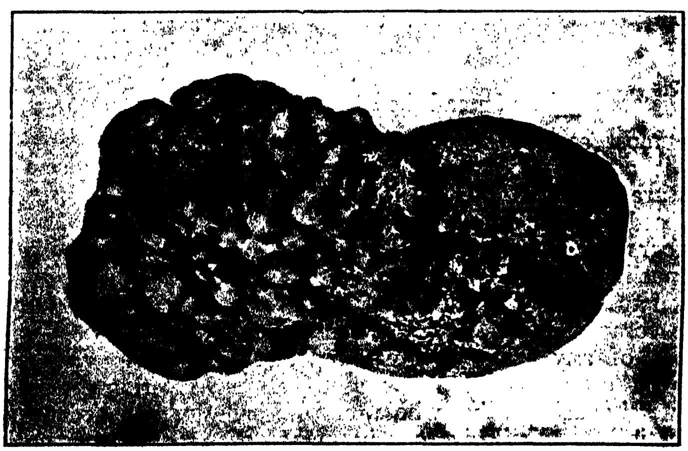
THE parasitic nematode or eelworm *Heterodera marioni* **causes a disease known as root knot or root gall on a very wide variety of plants. These include many field crops, ornamental plants, flowers and vegetables, fruit and other trees, nursery stock and a number of weeds. In the case of potatoes, the eelworm attacks both the roots and the tubers.**

Symptoms.

On the roots the first symptoms of eelworm attack appear as small swellings, which gradually increase in size until they form conspicuous galls. These galls are irregular in size and shape, and are sometimes ¼ inch in length.

On the tubers the condition first shows up in the form of pimple-like out growths. The surface of the tuber may later become quite warty, roughened (Fig. 1) and discoloured, necessitating considerable wastage in peeling for table use. If one of these tubers is cut across (Fig. 2), or if the skin and a thin slice of tuber is removed, round slightly brownish and often somewhat translucent areas are visible in the potato tissue. This discoloured tissue, which may go into the tuber for a distance of ½ inch, results from the penetration of the eelworms into the tubers. Sometimes small, glistening white bodies, more or less pear-shaped, and about the size of an ordinary pinhead can be

Fig. 1.—Potato Tuber Severely Affected with Eelworm.



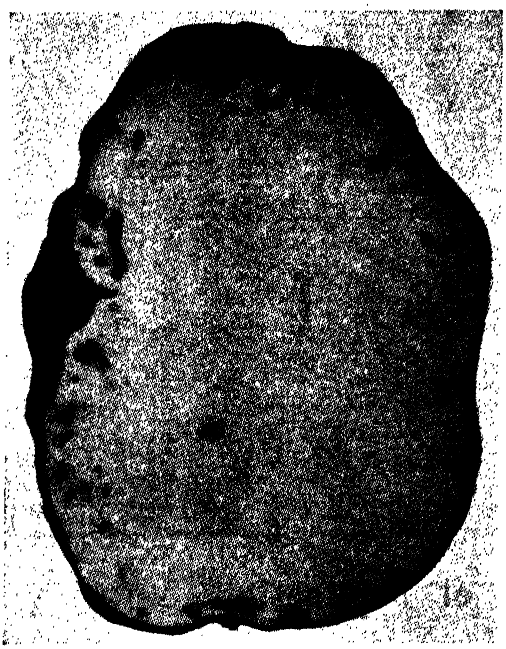


Fig. 2.—Section Through a Potato Tuber Infested with Eelworm. [After Cunningham.

found in the invaded tissue. These are the mature female eelworms. The formation of pimples and swellings on the surface of the potato tuber is a symptom of a fairly advanced and severe attack, and tubers may be infested without having any symptoms visible on the outer surface.

The root-knot nematode has some adverse affect on the growth of potato plants, although even severely diseased plants usually make fairly good growth. Effects are most noticeable in dry weather, when affected plants wilt quicker than healthy ones.

Diseased Tubers Spread the Disease.

The most serious aspect of this disease when it attacks potatoes is that diseased tubers are a means whereby the parasite is introduced to uninfested land, either when the tubers are used for seed purposes or when peelings and discarded tubers are fed unboiled to farm animals or thrown on the garden compost heap. For this reason, the presence of any eelworm-infested potatoes in a seed crop submitted for certification immediately debars the whole crop from certification. Similarly, consignments of table potatoes showing evidence of this disease may be completely rejected by potato inspectors.

The disease is usually introduced into an area by planting potato tubers or seedlings of other plants which are already infested with eelworms, but it may also be spread by means of running water, cultivation implements, animals, footwear, etc.

This disease is of most importance in sandy soils in coastal areas and, fortunately, is not yet widely distributed in the main, tableland potato growing areas which produce the greater part of the seed potatoes used in this State. During recent years, however, there have been several records of eelworm on potatoes in the tableland potato growing sections.

As a rule, this disease is most serious in light sandy soils and under fairly warm soil conditions. A temperature of about 80 deg. Fahr. is most favourable for rapid development of the eelworm, and at this temperature a full life cycle is completed in just under four weeks. At temperatures below 50 deg. Fahr. the nematodes are almost inactive, although they can survive temperatures well below freezing point.

Control Measures.

The following measures are recommended for the control of this disease:—

1. Do not plant eelworm-infested potato tubers. Care should be taken also that uninfested land does not become contaminated by planting diseased flower or vegetable seedlings.

2. Avoid spreading the disease by contaminated implements, etc. Clean areas should be cultivated before proceeding to areas which are known to be infested with eelworm.

3. Potatoes from a diseased crop should be boiled to destroy the eelworms before being fed to stock.

4. Practise a rotation of crops. Although there are many plants, including weeds, which are attacked by the eelworm, there are some crops, such as the grasses, cereals (wheat, oats, barley, rye, maize, sorghum), velvet beans, onions and peanuts, which are resistant.

In exceptional cases where a satisfactory rotation cannot be applied, grow only crops which occupy the soil during the cooler months of the year.

5. A summer fallow in which all vegetation is kept off the infested area is a cheap and effective means of practically eliminating eelworm from the soil in a single season. The soil must be cultivated at approximately weekly intervals, and always after rain. By this means, the eggs of the eelworms are hatched and, in the absence of food plants, the eelworms are starved and destroyed.

6. Treatment of the soil by means of heat or chemicals such as chloro-picrin, carbon di-sulphide, calcium cyanide and sodium cyanide is effective against eelworm, but these methods are much too expensive for the treatment of land used for growing potatoes. Details of these methods are available in Plant Diseases Leaflets 38 and 103, obtainable from the Division of Information and Extension Services of the Department.

Brown Rot of Potatoes.

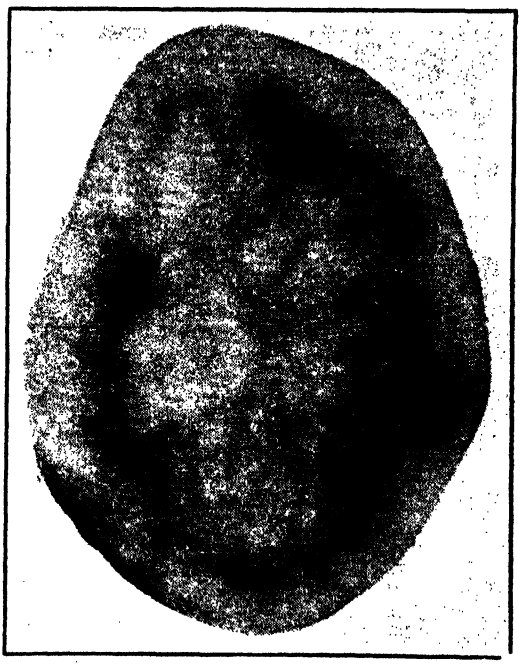
THE brown rot disease, also known as bacterial wilt, is caused by the bacterial organism *Bacterium solanacearum* which attacks, in addition to potatoes, over a hundred species of plants in thirty-five different botanical families. Weeds as well as cultivated crop plants are included in the host range. Plants most severely affected include potatoes, tomatoes, egg plants, peppers and tobacco, all of the botanical family *Solanaceae*.

Essentially a warm climate disease, it is of most concern in tropical and sub-tropical regions. In New South Wales it is most common in coastal districts, particularly on the North Coast.

Symptoms.

Besides producing a characteristic rot of the tubers, this disease is responsible for a wilting of the above-ground parts. This shows up first as a slight wilting of the leaves at the ends of the branches during the hottest period of the day. The plants recover during the night, but the wilting becomes more pronounced each day until finally there is no further recovery and the plants die. Sometimes only a few of the branches may be affected, and the remainder will appear healthy. A brown discolouration of the water-conducting tissue is evident if the stems, roots or stolons are cut through and usually, after a few minutes, bacteria ooze out from the discoloured portions of the cut surface, as a white, slimy mass.

Affected tubers may or may not show external symptoms, depending on the stage of development of the disease. The first visible external symptom is usually either a slight depression at the point of attachment to the stem, or a greyish-brown discoloured patch on the surface. In the more advanced stages, a bacterial ooze exudes from the stem end and the eyes, becomes mixed with the soil, and sticks to the surface of the tuber. Sometimes there are no external symptoms, but the disease can be diagnosed fairly readily by the internal symptoms. On cutting across infected tubers, a moist, brown discolouration, and slight softening of the water-conducting tissue extending in a ring around the tuber about ¼ inch below the skin are seen. Usually, but not always, yellowish-white, sticky globules of bacteria ooze out from the discoloured



Potato Tuber cut to show Internal Symptoms of Brown Rot.

tissues. The presence of this pus-like bacterial ooze distinguishes this disease from others such as Fusarium wilt, where there is a browning of the internal tissues, but no ooze. In the early stages, the disease is confined to the water-conducting tissues and there is no odour, but later the entire interior may become soft and brown and, with the entrance of other species of bacteria, a foul-smelling mass of rotting potato tissue results.

Infection Occurs from the Soil.

The disease is carried over from one season to the next in the soil as well as in affected tubers used for seed purposes, and it is an interesting feature of this disease that, unlike most other parasitic diseases, it is frequently more serious on newly-cleared land than on old, cultivated land. Usually the severity of the disease declines in any soil which is cropped year after year, but this is not always the case. The reason for this is not clear, although several explanations have been offered. These include: an increase in soil acidity, probably brought about by the addition of fertilisers; and the absence of certain wild hosts which do not ordinarily grow in cultivated fields.

Control Measures.

The following control measures are recommended:—

1. Use seed tubers free of the disease.

2. The variety Katahdin, which shows some resistance to brown rot, is recommended for infested land.

3. Practise a rotation of crops in which very susceptible crops such as potato, tomato, eggplant, or pepper are not planted in the same land more than once in every three or four years.

4. Add sulphur to the soil. Experiments in Florida (U.S.A.) have shown that the bacterium responsible for brown rot cannot live in a very acid soil (pH 4.0 or lower) and that, if commercial sulphur in appropriate quantities is added to the soil, control of the disease is secured. The acidity produced by the sulphur, however, is detrimental to the growth of most crops so that, some months after the addition of the sulphur, lime must be applied to the soil. Best results were secured in Florida by adding the sulphur in midsummer and applying the ground limestone about five months later but several weeks before planting the potatoes. The sulphur is disc-harrowed or ploughed into the ground which may be left unplanted or planted with a cover crop of cowpeas. From 300 to 1,300 lb. of sulphur per acre, sometimes more, are required, depending on the initial soil acidity. Usually about 3,000 lb. per acre of dolomite (magnesium) or calcium limestone is required to reduce the acidity brought about by the sulphur.

Certificate Necessary with Citrus for Other States.

THE Minister for Agriculture (Hon. E. H. Graham, M.L.A.) warns fruit growers and others consigning fruit to other States that care should be taken to comply with the inspection requirements of those States.

Recently several consignments of citrus fruit have been sent to Victoria and have been held up by Victorian authorities in the absence of a certificate by a fruit inspector that the orchard and the land within a mile radius is free from fruit fly.

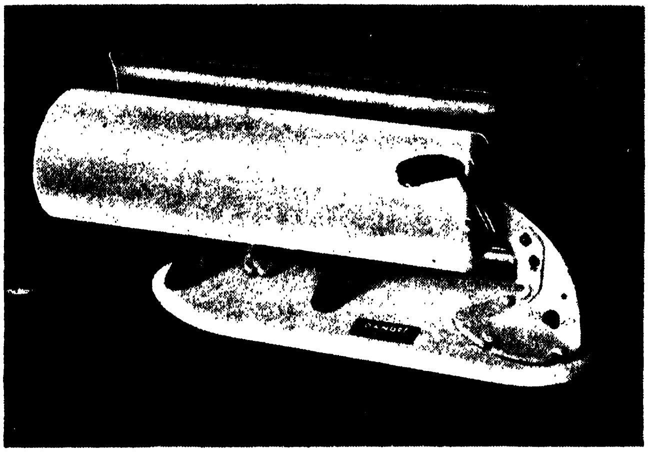
Requirements differ in respect of various States, and those unfamiliar with them should make inquiry of the local fruit inspector or from the Department of Agriculture, Box 36A, G.P.O., Sydney, in order to avoid placing themselves in a difficult position.

Varieties of Approved Seed Available.

IN order that farmers may be directed to what are regarded by the Department as the most satisfactory local sources of approved seed of recommended commercial varieties of farm crops and vegetables, the Department is willing to supply information concerning such sources of seed of the following varieties:—

Tomatoes—

Rouge de Marmande.



COMBATTING THE BLACK BEETLE IN MAIZE.

Soil Jetting Experiments with D.D.T. and "666."*

C. R. WALLACE, B.Sc.Agr., Entomologist.

DURING the period February-May, 1946, experiments were conducted at a farm near Berry on the control of black beetle (*Heteronychus sanctae-helenae*) in maize. The treatments applied were all designed to disperse an insecticidal emulsion through the soil around each plant in such a way that beetles would be repelled or poisoned before they could harm the plant. In all tests a knapsack spray-pump was used. With suitable nozzles it was easy to apply the emulsion as a forceful jet of small diameter, so that it gave almost instant penetration of the soil.

Emulsions of "666" (benzene hexachloride) and of D.D.T., when applied in this manner, caused beetles infesting the soil around plant roots to climb out of the soil and die at the surface. In addition most treatments provided a useful degree of crop protection, some for a few weeks and others for two to three months.

Early in 1945 the writer[1] used a method of plant protection whereby an emulsion was jetted into the soil around young vegetable plants. The following experiments and observations were undertaken to test the application of this method to a field crop such as maize.

Experiment 1.

In this experiment nine plots of young maize (arranged in three randomised blocks) were used to compare three different procedures, viz (*a*) jetting with "666" emulsion; (*b*) jetting with D.D.T. emulsion; and (*c*) check—no emulsion.

Layout.—Each plot was 8 feet in length and consisted of a single row of plants. All nine rows were parallel to each other, with a space of 3¼ feet between rows.

The maize had been planted on 22nd January, the grains being sown 4 inches apart in the row. Germination was good and the plants grew rapidly. On 15th February the soil on either side of the plants was cultivated in order to check weed growth and to prepare the soil for the jetting. By the third week of February the nine rows had formed a fairly even stand of plants 9 to 12 inches high, with some signs of beetle damage fairly uniformly distributed through the experiment.

During the third week of February† the following operations were carried out:—

(*a*) One jetting with "666"-xylene-"wetsit" emulsion containing 0.05 per cent. of the gamma isomer of "666."

(*b*) One jetting with D.D.T.-solvent naphtha-"wetsit" emulsion containing 0.1 per cent. of the para para isomer of D.D.T. The concentrate used in preparing this emulsion was a standard commercial product containing 20 per cent. of the para para isomer of D.D.T.

(*c*) Check: untreated.

Results.—It was found that both the jetting treatments (*a*) and (*b*) exercised a very marked protective effect upon the plants. Thus, in two of the three check plots (*c*) the beetles killed every plant but one; in the third check plot they destroyed nearly five-sixths of the row. In contrast to this, all rows treated with emulsion produced a good commercial yield of silage maize. Individual plot yields are shown in Table 1.

* Some of these results were briefly summarised on page 200 of April issue of the *Agricultural Gazette.*

† All jetting was to have been done on 15th February, but rain set in after the D.D.T. treatment had been applied to the three plots allocated to it; the three plots in the "666" series were not jetted until 19th February.

TABLE 1.—Yield of Maize at 21st May (three months after treatment).

Treatment.	Block I.	Block II.	Block III.	Total.
	lb.	lb.	lb.	lb.
(a) ("666") ...	15¾	15½	11½	42¾
(b) (D.D.T.) ...	14½	22	13½	50
(c) (Check) ...	9	0¾	1½	11¼

During the three months period which elapsed between jetting and harvesting, counts were made at intervals of all dead beetles at the soil surface near the plants. These counts are summarised in Table 2, which shows a substantial kill of beetles by the D.D.T. treatment and an extremely heavy kill by the "666" treatment. The figures for the latter would be equivalent to a kill of more than 400,000 beetles per acre in a crop planted with the rows 3 feet apart.

TABLE 2.—Dead Beetles Collected during the period 19th February–21st May.

Treatment.	Block I.	Block II.	Block III.	Total.
(a) ("666") ...	346	165	187	698
(b) (D.D.T.) ...	43	24	17	84
(c) (Check) ...	7	2	4	13

None of the plants in the experiment showed any ill-effects attributable to chemical action.

Experiment 2.

This was done in order to determine: (i) whether D.D.T. emulsion could be applied at planting time without affecting the germination of maize; and (ii) whether maize so treated would be protected from black beetle. The experiment incorporated eight plots (each consisting of one row of maize), arranged in four randomised blocks.

The course of the experiment was as follows: On 15th February, eight parallel drills were opened in well-tilled soil and twenty grains of maize were dropped into every drill. Each drill was 7 feet long and 3 inches deep; the spacing between drills was 2½ feet.

In four of the drills a coarse, driving spray of D.D.T. emulsion was applied, so as to wet the seed and the soil around it. The drill was then filled in with soil, after which the emulsion was jetted into the surface soil in line with the seed. The D.D.T. emulsion applied in this test was the same as that used in Experiment 1.

In the other four drills (which were kept as untreated checks) the planting procedure was identical with the above, except that no emulsion was applied.

Results.—By 23rd February (eight days after planting) the plants in all eight rows were 2 to 3 inches high and uniformly healthy in appearance. It was obvious that the D.D.T. emulsion had not harmed the germinating maize.

Beetle damage became evident in the experiment when the plants were about 3 to 4 inches high. By 28th February beetles had killed a total of thirty-one plants—one plant in the treated series and thirty plants in the untreated (check) rows. By 11th March more than half the plants in the check rows had been killed, with no further losses in the treated rows. Destruction proceeded until the four check rows were virtually eliminated, being reduced to a total of three isolated plants. At this stage (16th March) the D.D.T.-treated rows were almost unbroken, containing nineteen, fifteen, sixteen and fourteen plants respectively.

It was clear, therefore, that the D.D.T. emulsion had afforded very useful protection to the plants at a highly vulnerable stage of their growth.

Although this protective effect of D.D.T. was considerable during the first month it showed some decline thereafter. By the seventh week of the test the plants (which were then up to 2½ feet high) were experiencing sufficient beetle attack to interfere with their growth. By the ninth week many of the plants were being felled by the pest.

Some mortality of beetles was caused by the D.D.T. treatment—at least during the 3½ weeks after its application. During this period twenty-seven dead beetles were found in the treated rows compared with one dead in the checks. After 11th March no more dead beetles were found in the experiment.

Experiment 3.

The purpose of this test was to investigate the effect of "666" emulsion when applied to maize in its early stages of growth.

The experiment embodied six plots,* each consisting of three parallel rows of maize spaced 10 inches from each other. Each row was 5 feet in length and comprised fifteen plants.

Two different jetting procedures, A and B, were compared with an untreated check, C. The operations in each case were as follows:—

(A) On 19th February drills were opened, seeded with maize, sprayed with "666" emulsion and then filled in with soil. On 26th February, when the plants had appeared above ground, more "666" emulsion was jetted into the soil along the rows of seedling plants. The emulsion used on 19th February contained 0.05 per cent. of gamma isomer; that used on 26th February contained 0.09 per cent.

(B) Same planting procedure as (A); same spray treatment on 19th February but no subsequent applications of emulsion.

(C) Check; same planting procedure as (A) and (B) but no emulsion applied at any stage.

Results.—In the protection of plants from black beetle, there were striking differences between the treatments—see Table 3.

Table 3.—Plants Killed by Black Beetle, 28th February-24th April.

Treatment.	Plants killed 28 Feb. to 30 Mar. Block I.	Plants killed 28 Feb. to 30 Mar. Block II.	Plants killed 31 Mar. to 24 April. Block I.	Plants killed 31 Mar. to 24 April. Block II.	Total No. of Plants killed.	No. of Plants germinated.	Percentage of Plants killed.
							Per cent.
A	0	1	4	2	7	80	9
B	2	5	34	30	71	85	84
C	11	17	22	19	69	74	93

On 24th April all surviving plants were dug up for examination, which showed that almost every plant had been damaged to some extent by beetle. It was clear that, although no treatment had eliminated beetle damage, Treatment A had prevented any substantial killing of plants during the whole nine weeks of the experiment and that Treatment B had exerted a similar effect for half that period.

As regards the destruction of black beetle, Treatment A was outstanding, as indicated in Table 4. This lethal effect was not confined to the few weeks after jetting, but persisted strongly throughout the nine weeks of the test.

Table 4.—Dead Beetles Collected during Period 28th February–24th April.

Treatment.	Block I.	Block II.	Total.
A	127	197	324
B	9	8	17
C	15	18	33

By comparison with Treatment A, beetle mortality in B and C was negligible. The seeming superiority of C over B was no doubt due to unequal migration of a small percentage of dying beetles: because of the layout adopted,* plots of the C series were adjoined by four treated plots while those of the B series had only one treated plot adjoining them.

The emulsion applied on 19th February (Treatments A and B) was identical with that used in Experiment 1, Treatment (*a*); it contained 0.12 per cent. w/v of "666" (total isomers), 0.48 per cent. v/v xylene and 0.05 per cent. v/v of "wetsit." No signs of plant injury followed the application of this emulsion.

The emulsion used in the jetting of 26th February (Treatment A only) was prepared from a different concentrate and contained 0.35 per cent. w/v of "666" (total isomers), 2.8 per cent. v/v xylene and 1.54 per cent. "wetsit." It caused severe leaf burn in the young plants and also some retardation of their growth rate.

These adverse effects of the second emulsion were probably due to its high xylene content—the result of using a concentrate having an unduly high proportion of xylene to gamma isomer.

Notes.

In Experiments 1 and 2, about 1 gallon of emulsion was needed for each chain of row treated. When a nearby crop was jetted

* The comparison of the three treatments A, B and C was duplicated in two adjoining blocks, the six plots in the test being arranged in the sequence B, C, A, B, C, A. The two outermost plots were each flanked by a buffer row of maize at a distance of 10 inches.

(*Continued on page* 550.)

"666"* AS A CONTACT LARVICIDE.

Experiments with the Primary Sheep Blowfly (*Lucilia cuprina*).

G. J. SHANAHAN, B.Sc.Agr., Assistant Entomologist.

IT has been previously reported (¹) that early third instar larvae of *Lucilia cuprina,* the primary sheep blowfly in Australia, failed to develop completely when placed on to finely-chopped liver containing 0.5 per cent. "666" on a weight for weight basis. Preliminary trials to explain the mode of action of this insecticide suggested that "666" was an extremely effective contact larvicide. Additional experiments have been carried out to study this aspect. The following statement contains an outline of the methods used and the results obtained from these investigations.

Methods.

The contact effect of "666" was determined by placing prepupae into tins which contained 0.5 gram of treated wool. The wool was well teased and covered the bottom of the tins, which were 2½ inches in diameter and 2 inches in height, and were provided with closely fitting lids with wire gauze windows.

Bulk samples of wool were thoroughly wetted by steeping in 700 ccs. of "666"-xylol and xylol water emulsions. Excess moisture was removed and the wool air dried for at least ten days before commencement of an experiment. The "666"-xylol water emulsion was prepared from a stock solution of "666" in xylol with a suitable emulsifier by the addition of 1 part of the solution to 140 parts of water. The xylol water emulsion was made by adding xylol and the emulsifier to water in proportion of 1 part of xylol to 140 parts of water.

Twenty prepupae were placed into each tin. Each treatment was replicated three times and the experiment repeated thrice. The tins were kept in an incubator at 75 deg. Fahr. with high humidity.

* Benzene hexachloride (13 per cent. gamma isomer content).

¹ *Agricultural Gazette, N.S.W.,* July, 1946, page 382.

Results.

The average percentages (of the three replications) of prepupae which failed to complete their development for each treatment in the three experiments are tabulated below.

Table of Results.

Wool Treatment.	Average percentage of prepupae failing to complete development.		
	Experiment I.	Experiment II.	Experiment III.
0·5 per cent. 666-xylol emulsion	100	94	99
0·1 per cent. 666-xylol emulsion	72	55	53
1 : 140 xylol emulsion	16	18	25
No treatment ...	21	23	27

Conclusions and Comments.

1. A high percentage of *L. cuprina* prepupae fail to complete their development when placed in contact with wool which had been treated with either a 0.1 per cent. or a 0.5 per cent. "666"-xylol emulsion. Four prepupae only completely developed in the three experiments when placed in contact with 0.5 per cent. "666"-xylol-emulsion treated wool.

2. Since the prepupae do not feed, it may be assumed that the "666" has acted as a contact insecticide in these investigations.

3. The contact larvicidal property of "666" demonstrated in these experiments suggests that this insecticide may be suitable for jetting sheep to reduce blowfly loss. [In limited field trials samples of wool taken from the crutch area of ewes, five weeks after being jetted with 0.5 per cent. "666"-xylol emulsion, were toxic to prepupae.]

4. The conclusion can also be drawn from these studies that "666" could prove to be an important constituent of blowfly dressings.

DROUGHT

and the

RAILWAYS

From time to time the Department of Railways is called upon to do special work of national importance. Recently, such a task has been the hauling of thousands of starving livestock from drought-stricken districts in the north and north-west to southern areas of the State.

The vast exodus of animals was well under way in June. During July and August as many as 25,000 cattle and 400,000 sheep were moved by rail to fresh fields and pastures new.

The trains hauling these starving livestock have to travel very long distances. A typical journey, Walgett to Wagga Wagga, is 656 miles. Incidentally, over that distance, a railway truck load of 100 starving sheep is hauled for £13/12/2d. on the forward journey, and the sheep are returned free. This means that the Department only receives 1d. in revenue for hauling each sheep a distance of 40 miles.

Also, in July and August, the Department carried 54,000 tons of fodder over long distances to the drought-stricken districts.

These large movements of starving livestock and fodder were achieved despite difficulties arising from an acute shortage of coal.

S. R. NICHOLAS,
Secretary for Railways.

Australia is Free of—

SOME SERIOUS BEE DISEASES WHICH OCCUR OVERSEAS.

BEEKEEPERS MUST ASSIST TO PREVENT THEIR INTRODUCTION.

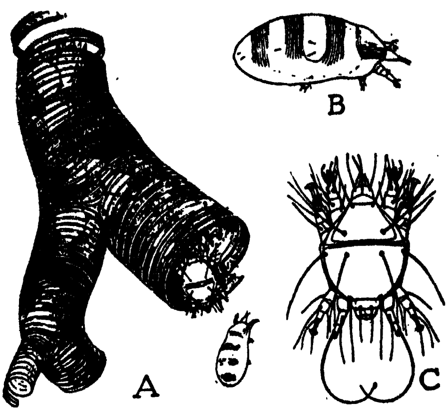
WHILST it is essential that bee-farmers gain a full knowledge of bee diseases which occur in Australia, it is also most desirable that they become conversant with the serious diseases which exist in other countries, in order that they may realise the necessity for the strict quarantine regulations now in force, and which, no doubt, have been the means of keeping these diseases out of the country in the past. It is obviously in the interests of beekeepers to co-operate with the authorities in preventing the introduction of these diseases in the future.

The most devastating disease which occurs overseas and which is prevalent in some European countries is Acarine Disease, and it is necessary to avoid introduction also of two others, namely, European Foul Brood (*Bacillus pluton*) and the Bee "Louse" (*Braula coeca*)—listed as a disease—both of which occur in European countries and in America. *Braula coeca* has already reached Tasmania and quarantine regulations to prevent introduction to the mainland of Australia have been gazetted; they are quoted later in this article.

Acarine Disease.

Acarine Disease is caused by a mite which has been given the name, *Acarapis woodi.* Prior to 1920, the disease was known exclusively as "Isle of Wight Disease", and thought to have been caused by the protozoan, *Nosema apis*.

The mite enters the respiratory system, the orifices of which extend along both sides of the body of the bee. With heavy infestation the trachea becomes so congested with the mites that breathing is difficult, and this together with the absorption of poison resulting from the infection, produces symptoms somewhat similar to the well known malady, Paralysis of Bees. The muscles of some of the legs of infected bees crawling or rather dragging their bodies about in front of the hive are observed to be affected and there is a tendency on the part of these disabled bees to form small groups. Neither of these symptoms are so noticeable in paralysis. Another slight difference is that bees suffering from mite infestation do not have that greasy appearance so often observed in paralysis.



Acarine Disease Mites and Infested Trachea.
[*After Snodgrass.*

Whilst symptoms may provide a useful guide, a sure diagnosis can only result from microscopical examination of the tracheal system of infected bees. Such an examination is made, by the Department's Chief Entomologist, of escort bees which accompany queen bees imported to Australia. This is the industry's safeguard against introduction of Acarine Disease. Quarantine regulations require that all imported bees be consigned to the Chief Quarantine Officer (Animals) at this Department. These regulations were published in the January, 1946, issue of the *Agricultural Gazette.*

European Foul Brood.

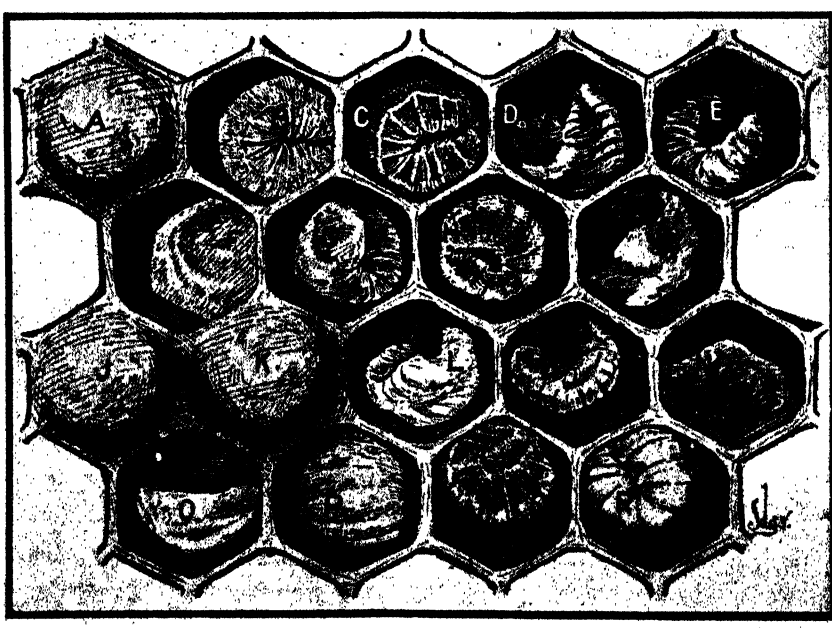
This disease is the cause of serious losses in some overseas countries. Weak colonies experiencing difficulty in building up following adverse seasonal conditions are most susceptible to the disease. Such bees have little chance of building up the necessary resistance. On the other hand, progressive colonies securing useful supplies of nectar and pollen may entirely resist or readily overcome infection. This is an important point of difference between this disease and American Foul Brood which is rarely, if ever, cured without special treatment. There is no evidence that European Foul Brood exists in New South Wales. This view is expressed following microscopical examination of brood from numbers of hives where some points of similarity in symptoms to the disease has been found. *Bacillus pluton,* the causal agent of European Foul Brood, was not revealed in the diagnosis.

Symptoms.—As will be seen by the illustration of European Foul Brood, the majority of infected larvae die before being sealed. Worker, queen, or drone larvae may become infected. Other symptoms may be enumerated as follows:—

1. The infected larvae assume unnatural positions in the cells (see illustration).

2. The colour of infected larvae changes from pearly-white to a slightly yellow

European Foul Brood.
Portion of comb, showing effect of European foul brood upon the larvae. A, J, K, normal sealed cells; B, C, D, E, G, H, L, M, P, Q, larvae affected by disease; R, normal larvae at age attacked by disease; F, I, N, O, dried down larvae or scales.
[*From F.B.975, U.S. Department of Agriculture.*



colour, deepening until the dead larvae become a brownish-yellow, greasy mass in various positions in the cells.

3. Other infected larvae in the same comb retain their curved shape, the segments and tracheae (air tubes) being plainly visible, and the colour becoming greyish-yellow, and finally dark brown.

Bee Louse on Thorax of Honey Bee, Indicated by Arrow.
[From the *American Bee Journal.*

4. Dead larvae are found after sealing, but the proportion is small when compared to the unsealed dead larvae.

5. The diseased remains are slightly "ropy," but the "ropiness" is not as pronounced as in American Foul Brood.

6. The cappings on such cells as are sealed may be discoloured, sunken, and perforated.

7. The odour from infected brood is offensive, but not the same as that which characterises American Foul Brood in an advanced stage. Odour is only one of the symptoms, however, on which the apiarist must base his diagnosis.

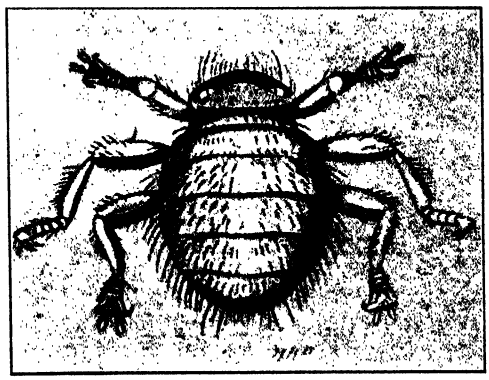
The disease is highly infectious, but usually disappears during a honey flow. The method of spread of infection has not been clearly proved.

Danger of Introduction.—This disease could be readily introduced if the importation of small established colonies of bees, for instance by persons travelling by air, was allowed. However, quarantine regulations are strict in this regard and only queen bees accompanied by the required escort workers in cages, addressed to the Chief Quarantine Officer (Animals) are permitted to land. All beekeepers for their own protection, and in the interests of their industry generally, should co-operate fully with the Quarantine Authorities to guard against further introduction of this and other diseases.

The Bee "Louse" (*Braula coeca*).

Braula coeca (pronounced "seeka") is a well-known pest of the honey bee in some European countries, but so far we have no evidence of it occurring on the mainland of Australia.

Braula coeca has spread to the United States and to as near to us as Tasmania. It is not a true louse (a blood-sucking parasite), but rather, as Dr. Phillips of the United States describes it, "a guest insect." It is about 1/16th inch long (about the size of the head of a pin), reddish-brown in colour, with body well covered with hairs, and it has a flattened head. Each leg is equipped with a set of about thirty teeth-like claws, enabling it to obtain a good grip on the hairs of the bee.



Braula coeca, **the Bee "Louse" (greatly enlarged).**
[From the *American Bee Journal.*

When bee "lice" are numerous in the hive they invariably cause a great deal of inconvenience and distress to the bees, and they particularly infest the queen. With heavy infestation the queen becomes very listless, and her egg-laying work is considerably disturbed. Cases have been observed in which the colony has become depressed, and in this condition the bees are likely to contact other diseases, such as dwindling, sac brood, etc.

All imported bees are examined for *Braula coeca* before the queen is transferred to a new cage with fresh escort workers and released from quarantine. This parasite can be seen with the naked eye, but a magnifying glass is used when making inspections. The presence of one *Braula coeca* may result in the whole consignment being condemned.

Regulations Governing Importation from Tasmania.

As the bee louse has been found to occur in Tasmania, a special Commonwealth Quarantine Proclamation (No. 24A), prohibits the removal of bees, bee combs and used beehive material from the State of Tasmania into any other part of the Commonwealth unless accompanied by a certificate signed by a Government veterinary surgeon or Government apiary inspector in the State of Tasmania, certifying—

"(a) that the bees, bee combs, or used beehive material—

(i) are free from *Braula cocca* infestation; and

(ii) are being removed from an area which is within a radius of twenty miles from the apiary of origin and which is free from *Braula coeca* infestation; and

(b) in the case of a consignment of bees—that queen bees and not more than twenty escort bees only are in the consignment, and that they are consigned to the Chief Quarantine Officer (Animals Division) in the State or Territory to which the bees are being removed."

Combatting the Black Beetle in Maize.

(*Continued from page* 545.)

it was found that 1 gallon sufficed for 1½ to 2 chains and gave a good kill of beetles. On this basis an acre of crop would require about 150-200 gallons.

Rainfall at Berry during the 3½ months period of the tests totalled 16½ inches, made up as follows: February (latter half) 1.32 inches, March 3.19, April 10.35, May (1-21) 1.64 inches.

This article describes only three effects of the jetting method, viz.: (1) its protection of maize from black beetle attack; (2) its insecticidal effect upon black beetle; and (3) any gross and obvious signs of chemical damage to the plants. Apart from these three, little is known of the effects of the treatments; they are so new that any disadvantageous results which may be associated with them have yet to be discovered.

Acknowledgments.

Mr. S. Ison, of Berry, very kindly provided land and facilities for the work. Mr. D. D. O'Neill, Assistant Analyst, made analyses of some materials used in the tests.

References.

[1] Wallace, C. R.: "Protection of Plants from Black Beetle by D.D.T., applied to the Soil." Jour. Aust. Inst. Agric. Sci., Vol. 11: No. 3, pp. 135-139. Sept. 1945.

Progressive Farmer Competition—A Record of the Candidates' Achievements.

A RECORD of the achievements of the candidates in the Progressive Farmer Competition, conducted earlier in the year by the Agricultural Bureau of New South Wales, and sponsored by the Rural Bank of New South Wales in conjunction with radio station 2GZ, has been published by the Rural Bank—in the form of a booklet captioned "By Your Deeds."

Nicely produced and well illustrated, the booklet sets out the qualifications which won the competition for Mr. K. Gardiner of Blayney (who is now in the United States of America), and also describes the methods of farming and ways of life of the other divisional finalists.

It is hoped by the publishers that the book will serve as an inspiration to other primary producers.

FEEDS AND FEEDING NOTES.

Contributed by
The Division of Animal Industry.

Blood Meal for Pigs and Poultry.

SHORTAGE of meatmeal should direct attention of farmers to other high protein feeds.

Blood meal, an exceptionally high protein meal, is a valuable protein supplement for pigs and poultry, and could be used to a greater extent than at present. Some abattoirs have reported ample supplies and difficulty in making sales for stock feeding. Blood meal contains 70-80 per cent. protein as against 45-60 per cent. in meatmeal, but differs from meatmeal in containing very little mineral matter. Where blood meal is substituted for meatmeal in rations, bone meal, 2 per cent. should be added to make up for this deficiency; 1 lb. of blood meal could substitute for 1½-2 lb. of meatmeal depending upon the protein content of the meatmeal.

Blood meal has been reported to affect hatchability if fed in breeding rations, but this is probably due to its low vitamin content in comparison with meatmeal. Vitamin-rich feeds such as buttermilk, skim milk or whey butter, liver meal, lucerne meal and green feed should be increased if blood meal is substituted for meatmeal in breeding rations.

Palatibility of feeds containing blood meal is sometimes a factor of importance with pigs, and gradual introduction may be necessary before stock will take readily to the feed. Three ounces per day is usually adequate for pigs.

Supplies of Milk Powders.

The period of maximum milk production, and therefore maximum production of such by-products as dried skim milk, buttermilk and whey powder, unfortunately does not correspond with the period of maximum requirements for these materials. Poultry breeders have greatest need for these materials during winter and early spring, whilst maximum production is not reached till late spring or early summer.

In view of the shortage during the hatching season of these vitamin-rich materials, so necessary for maximum hatchability and growth of chickens, hatcherymen would be well advised to lay in supplies of these milk powders during the spring and summer months in preparation for their needs during the following winter.

Leaching Causes Loss of Food Value.

It is commonly recognised that feed leached by rain is decreased in food value, but the extent of this loss is not sufficiently realised.

In some experiments carried out on leaching of various types of feed, it was found that from 25 to 67 per cent. of the mineral content of the feed was lost by leaching; soluble carbohydrates, *i.e.*, sugars and starches, were lost to an extent varying from 6 per cent. in dry grasses to 35 per cent. in burr clover; and protein lost varied from 16 per cent. in burr clover to 18 per cent. in grasses. It is significant that the food matter lost by leaching was the most soluble and hence the most readily available food matter in the feeds. The material not lost by leaching would be the insoluble portion, and therefore the most difficult to digest.

From these figures it can be seen that exposure of feed to rain—such as by leaving hay in the paddocks excessively long after cutting, or building of faulty stacks—has a decided effect on the food value of the material. The decrease in food value of dry pasture which occurs after rain is well known, but these figures further emphasise the necessity for hand feeding of stock after rain has leached dry feed and before the rain has caused any volume of new growth.

LICE OF POULTRY.

Widespread Parasites.

Control by Regular Examination and Treatment.

R. C. DENYER, B.V.Sc., Veterinary Officer.

LICE are the most widespread of all external parasites of poultry. The effects of infestation of birds may not always be obvious, but, unthriftiness, lowered egg production and hindered growth and development of young stock may all be due to poultry lice. The heavier the infestation, of course, the greater is the effect on the birds, and great loss of weight may result and chickens may be killed in severe infestations.

The control of lice is not difficult, and provided the birds are examined regularly and treatment is carried out when necessary, no trouble need be experienced from this parasite.

The louse itself is an insect and a number of different species are found in this country. It is sufficient, however, to consider poultry lice as belonging to one of several different types, named after the habits of the species included. Thus there are head, body, shaft, wing, chicken and fluff lice and, of these, the first three types are the most common.

Head and Body Lice are found on the skin, while the Shaft Louse is usually attached to the base of feathers. All types are very small, being from 1/8 to 3/16 inch in length, and greyish or yellowish in colour. They are oval-shaped, have an enlarged head and are flattened so that they can be easily recognised when seen.

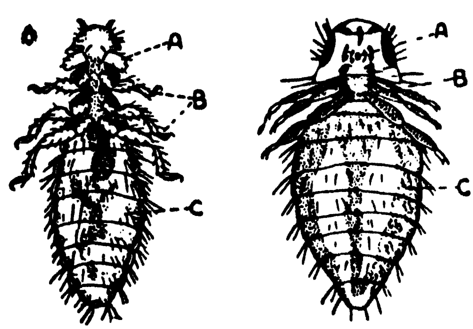
All poultry lice in this country are of the "biting" variety, although they are able to suck blood from the base of the quill feathers. However, they live mainly on fragments of skin and feathers and the irritation caused leads to the loss of rest and sleep.

The Life Cycle.

The entire life cycle, which is approximately the same for each species, is completed on the bird and takes from 2 to 3 weeks. So rapidly do the lice multiply, especially in winter, that in a few months a pair of lice may produce over 100,000 descendants. The eggs are laid in clusters which are glued to the feathers and hatch out in from 5 to 8 days. The young lice moult two or three times and become fully grown in 2 to 3 weeks.

Method of Spread.

Lice spread by direct contact, crawling from one bird to another when they are on the roost or close together at other times.



Poultry Lice.
Left.—Body Louse (*Monopon bisériatum*).
Right.—Shaft Louse (*M. pallidum*).
[*After Kaupp*

On the birds the lice can live for several months, but when separated from their host they die within a week. This being so, sheds which have housed heavily infested birds may be safely used for introductions after being rested for 7 to 10 days. With this precaution young stock which have been raised free of infestation can be transferred to laying sheds without danger of becoming infested.

Any birds introduced on to the property should be carefully examined, and if infested, should be isolated and treated until clean.

Control Measures.

The control of lice infestation is not difficult, and provided the birds are examined regularly and treated when necessary, no trouble need be experienced from this parasite. As the lice live for a short period only, apart from their host, treatment is directed towards killing the lice on the birds.

Apart from Head Lice, all species respond to the same treatments. Treatment may be carried out in several ways, such as by fumigation, hand treatment, or dipping.

Young chickens should never be treated, nor should this be necessary. When raised artificially, *i.e.*, in brooders, they should not acquire an infestation as they are not in contact with infested birds. If they are to be reared under hens, these birds should be free of infestation before being set.

Fumigation.

This method is by far the most satisfactory for flock treatment, as large numbers of birds can be quickly and effectively treated at low cost and with little bother. Black leaf 40 (commercial nicotine sulphate) is used, being applied along the perches just as the birds go to roost. It is best used by running a thin trail of the solution along the perches through a small hole in the bottom of a tin, or through a hole in the container in which the material is supplied, but it may also be satisfactorily applied by painting on with a brush. When the birds go to roost the warmth of their bodies vaporises the solution and the fumes rising through the plumage, kill the parasites.

This method may only be used under certain conditions. A calm night must be chosen so that the fumes are not dispersed, and for the same reason partially enclosed sheds which, however, must be adequately ventilated, are necessary. The ideal type of shed (commonly in use on commercial farms) is one enclosed on three sides with an open front and ventilation space under the eaves of the roofing. If the material is used too liberally or if the shed is inadequately ventilated, some of the birds may be killed by the fumes of nicotine sulphate. Head lice are not killed by this method and hand treatment must be resorted to.

Where small numbers of birds are run and fumigation cannot be carried out efficiently, one of the other methods described below should be used.

Hand Treatment.

Methods of treatment other than fumigation and dipping, in which a number of different materials may be used, can be grouped under three headings, namely, dusting, the use of various oils and the application by hand of other preparations.

(*a*) *Dusting.*—Derris powder and sodium fluoride are useful as dusting powders, while flowers of sulphur may also be used, but it must be applied very liberally and frequently and is not as effective as the other compounds. Recent trials show promise of D.D.T. being very effective when used as a 0.5 per cent. dust, but extensive trials in the field have yet to be made to determine the value of this preparation.

Derris powder and sodium fluoride are used by mixing with starch, pyrophyllite, kaolin or some other such powder at the rate of one part of the former to four parts of the latter.

No matter which powder is used, the method of treatment is the same. The bird is held upside down by the legs and the material is dusted in under the feathers and rubbed on to the skin. A tin with a perforated lid is ideal for applying the dusting powder.

(*b*) *Oiling.*—Various oils such as neatsfoot and olive oil, or a mixture of two parts lard and one part kerosene by measure may be used to advantage, and are the most effective treatment for birds suffering from Head Lice. Other methods are preferred to oiling, for Body Lice, but if used, a rag is soaked in the material and the feathers around the head, vent and shanks, as well as those under the wings and along the breast are thoroughly oiled by rubbing with the rag so that the material is rubbed on to the skin. In treating Head Lice, the head only is treated in this way.

(*c*) *Nicotine Sulphate.*—A very popular and efficient hand treatment is the application of two or three drops of nicotine sulphate below the vent. An oil can is generally used in this method. This treatment may be carried out at any time with

safety, and is very useful for treating cockerels if the fumigation method has been unsuccessful, as it frequently is with this sex, owing to the length of the birds. The method is very safe and is frequently favoured for treating small numbers of birds or very valuable birds. Its disadvantage is that, like fumigation, it is ineffective against Head Lice.

Dipping.

Dipping is dangerous to fowls if adequate precautions are not taken, but can be satisfactorily carried out providing the following points are observed. A warm fine morning must be chosen and the birds must be handled carefully as indicated below during the operation.

Sodium fluoride solution at the rate of 1 oz. to a gallon of water, and derris powder at the rate of ¼ oz. to a gallon of soapy water are two effective preparations. In treatment, the bird is held by the wings and plunged into the solution several times so that the skin is wet, but *great care must be taken when doing this not to immerse the head*. The head is then dipped into the solution quickly so that the bird does not swallow any of the material. The bird is held for about 10 seconds to drain before being released.

Number of Treatments.

Irrespective of the method of treatment used, it is essential that it be repeated after an interval of a week so as to kill any lice which have hatched out in the interval from eggs which were not killed during treatment. On occasions, persisting infestations may indicate that a third treatment is necessary.

In addition to the control measures outlined above, measures may be taken to incorporate various materials in the dust baths and in the nests. Flowers of sulphur is valuable, especially in the former case, while recent indications are that a 1 per cent. D.D.T. powder, used in the nests or dust baths, will give good results in limiting the infestations.

Summary of Control Measures.

The following programme of control measures should ensure that no loss is experienced from this parasite.

(*a*) Inspect all introduced birds, and if necessary isolate and treat them until free of lice.

(*b*) Raise young stock free of infestation by preventing contact with infested birds or houses.

(*c*) Treat the flock whenever necessary and inspect birds regularly for evidence of further infestations.

Agricultural Societies' Shows.

SECRETARIES are invited to forward for insertion in this list dates of their forthcoming shows; these should reach the Editor, Department of Agriculture, Box 36A, G.P.O., Sydney, not later than the 15th of the month previous to issue. Alteration of dates should be notified at once.

1946.

Griffith	October 1, 2
Walbundrie (C. Lieschke)	October 2
Bribbaree	October 2
Singleton (N. Shaddock)	October 3, 4
Albury (A. G. Young)	October 8, 9, 10
Lismore—North Coast National Exhibition (C. C. Dean)	October 15, 16, 17
Holbrook	October 25, 26
Murwillumbah (J. L. Banner)	October, 30, 31
Bangalow	November 12, 13

1947.

Queanbeyan (D. Vest)	February, 21, 22
Tumut	March 4, 5

THE benefit to be derived from systematic utilisation of animal manure on the pasture is still to be appreciated by the Australian farmer, and a means of soil improvement which, solely on a plant food basis, is of enormous value is allowed largely to go to waste. Not only has the dung a beneficial effect from the manurial ingredients it supplies, but it also helps to conserve soil moisture and stimulates the action of soil bacteria.

Droppings are always heaviest in night paddocks, and one of the surest means of building up the fertility of a poor area is to use it as a night paddock for an extended period and to harrow in the droppings regularly. In a departmental experiment in renovation of a paspalum paddock it was estimated that in three years, by regular grass harrowing, a 2-inch mulch of animal manure had been worked into the surface soil. Where harrowing is not carried out regularly, much grass is spoilt and unpalatable tussocks develop around the droppings.

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Portion of the Poultry Section at Hawkesbury Agricultural College.

Poultry Notes.

E. HADLINGTON, Poultry Expert.

THE PURCHASE OF INADEQUATELY EQUIPPED FARMS.

A COMMON CAUSE OF FAILURE.

Minimum Requirements.

BECAUSE of the difficulties involved in building under present conditions, many people taking up poultry farming are buying established farms, rather than face the troubles associated with erecting new buildings. There would be little objection to this course if suitable farms were secured, but in many instances the purchaser invests all his capital in a farm which is supposed to be a "going concern," only to find, after bitter experience that the equipment is inadequate or unsuitable for the efficient working of a full-time poultry-raising project.

A number of these cases have recently come under notice, and advice has only been sought after trouble has been experienced in attempting to raise chickens without proper facilities.

Unfortunately, some of the farms have been acquired by ex-servicemen, who have put everything into the venture and are unable to finance the erection of additional accommodation to rectify the shortcomings of the farm and afford a reasonable chance of success. In other cases the area of the farm does not allow for providing extra pens, and the result is that the birds are cramped in small pens, causing unthriftiness among young stock.

The fact is that there are very few fully equipped farms for sale, and if this were generally realised there would be less disappointments and failures in the industry.

Minimum Requirements.

To enable satisfactory operation, every poultry farm should be equipped with the following facilities:—

(1) *A brooder house* with adequate brooder accommodation of a type which will provide ample warmth, even in the coldest weather.

(2) *Weaning pens* as described in last month's "Notes", into which the chickens may be transferred after they leave the brooders.

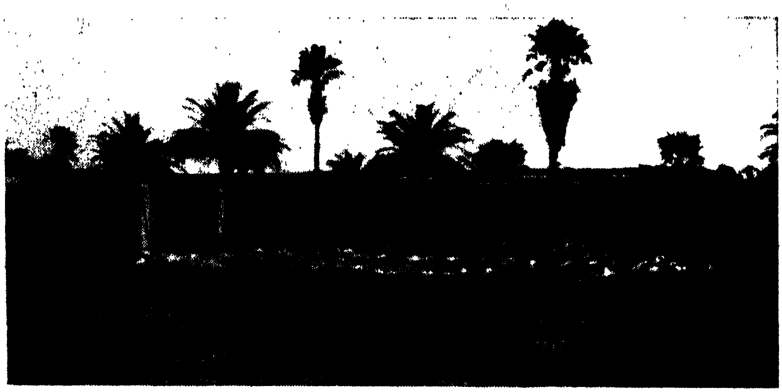
(3) *Sufficient colony houses* to accommodate about fifty birds in each, and to provide for all pullets to be raised during the season. These should be placed in large enclosures, preferably only three or four in each, allowing a minimum of 100 square feet of run to each pullet.

Runs of this size are necessary to maintain the land in a healthy condition and prevent the grass being permanently worn off. Such runs should be spelled for at least three months each year, and should not at any time be used for adult birds.

should be realised that houses without such floors are difficult to maintain in a sanitary condition and involve much more labour to keep clean.

Certain labour-saving machinery, such as power green feed cutter, mash mixer and a gristing mill are a decided advantage on a farm, but the intending purchaser should not be unduly influenced to purchase a farm because it is equipped with these, if it is lacking in other important equipment as outlined.

As far as the stock is concerned there should be a well-balanced flock, the ages of the birds varying according to the time of the year. Taking a "one man" farm of a



Weaning Pens at Hawkesbury Agricultural College.

thousand layers as an example, the numbers at this time of the year should be made up of at least 600 pullets hatched between June and September, 550 first-year hens raised the previous season, and 450 hens a year older. Of these, the older hens would, under normal conditions, be gradually marketed from about November onwards as they cease payable production, and be replaced by the pullets being raised.

A small percentage of the first-year hens would also normally be culled for various reasons, but especially if they break into a moult before the end of February.

(4) Houses for laying stock to provide for the total number of adults birds on the farm. These should face north, be well ventilated, and fitted with perches not less than twenty inches apart, allowing thirty feet of perch to each fifty birds. Large runs are desirable for adult birds and should have an area of at least sixty square feet per bird.

(5) *A fed shed* capable of holding two to three months' supply of feed.

(6) *An egg storing and packing room* which should be in as cool a position as possible, and insulated against high temperatures.

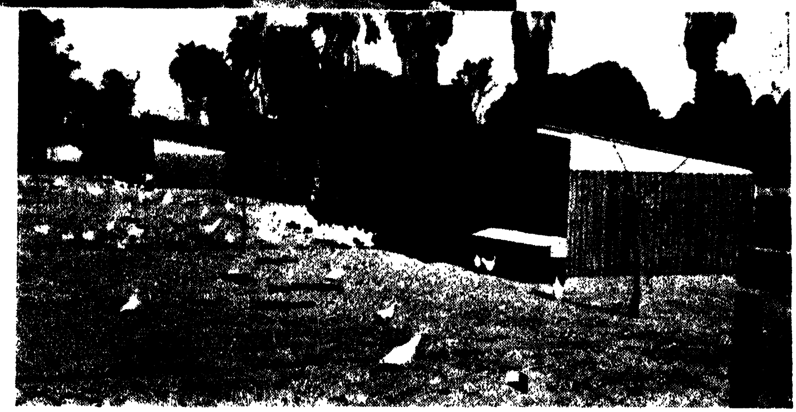
Important Points to Consider.

It is important that all the pens for young stock should have either concrete or wooden floors, and it is a decided advantage to have similar floors in the houses for layers. It

The Area of Land.

While a farm of 1,000 layers can be established in an area of about 3½ acres, it is not wise to restrict one's operations to a "one man proposition," as, at a later stage, it may be desired to increase to

Colony Yards at Hawkesbury Agricultural College.
Being rested before the young stock are placed in them.



Semi-intensive Houses and Runs for Layers at the College.

a point where labour could be employed and thus relieve the constant nature of the work. Thus 5 to 6 acres is little enough to acquire for a poultry farm, and if it is desired to keep a cow, another acre or so is advisable.

The Feed Problem.

ONCE again drought conditions have affected the wheat crop over a large part of this State, and it is now apparent that there is little hope of any increase in the quota of wheat allotted for stock feeding during the next year. This means that the poultry industry will be placed in a serious position, especially in view of the reduced output of mill offals and lack of transport at the present time to convey oats from country stacks and from other States. Oats and barley are the only cereals likely to be available before next April, when grain sorghum is harvested—and unless good rains fall in the north-west within a short time, supplies of the latter grain may be limited.

Until supplies of grain sorghum are available the only substitutes which can be used to augment mill offals are ground oats, barley, and a small amount of wheatmeal, but unless there is a quick improvement in transport facilities, only limited supplies of oats will be available for gristing into meal, and barley will not be obtainable until after the coming harvest.

Every effort is being made to induce the transport authorities to make more trucks available to improve deliveries, but it appears inevitable that, owing to prevailing conditions, the feed supply position will be precarious during the next twelve months.

In the circumstances the only course to follow, where difficulty is experienced in obtaining full supplies of feed, is to make a thorough culling of the second-year hens, and where any surplus cockerels are being raised, to market them as they attain a suitable size.

Brucellosis-free Herd Scheme (Swine).

THE following is a list of the names and addresses of owners of herds which have been declared brucellosis free in accordance with the requirements of the Brucellosis-free Herd Scheme (Swine). The work in connection with this scheme has been undertaken as part of the general campaign against this disease and should perform a valuable service to the industry generally. Owing to the limitations of staff it will not be possible for the Department to undertake the testing of herds in general for this purpose, and in future only herds belonging to Government institutions, registered stud herds, or those containing a preponderance of registered stud animals, will be accepted for inclusion in the list. A charge will be made for the work, since the inclusion of a herd in this list should be of benefit to the owner. After a herd has been accredited, two semi-annual tests will be required, and thereafter annual tests, provided that the conditions outlined in the agreement form are strictly adhered to and that negative results are obtained at each test. So far as the elimination of the disease is concerned, apart from placing the herd on the accredited list, this work will continue as at present.

Registered Stud Herds.

Bathurst Experiment Farm, Bathurst.
Boardman, C. M., " Fairview," Camden.
Campbell, D., " Hillangrove," Wamberal, via Gosford.
Cocks, F. D., " Condalarra," Miranda.
Cowra Experiment Farm, Cowra.
Croft, F., Lugwardine, Kentucky.
Draper, R. E., " Glengar," Capertee.
Foley, J. B., Gundurimba Road, Loftville, via Lismore.
Garrison Battalion (2nd), Manly.
Gladesville Mental Hospital.
Government Agricultural Training Farm, Scheyville.
Grafton Experiment Farm, Grafton.
Harris, K. H., Pennant Stud Piggery, Purchase Road, West Pennant Hills.
Hawkesbury Agricultural College, Richmond.
Holland, A. L., Argonne, Tubbul.
Hurlstone Agricultural High School, Glenfield.
Maybin, N. C., Towac, Orange.
New England Experiment Farm, Glen Innes.
Newington State Hospital and Home, Newington.
Ricketts, C. C., " Mangus," Young.
Riverina Welfare Farm, Yanco.
Rydalmere Mental Hospital.
Shirley, G. F., " Camelot," Penrith.
Upston, H. E., Wattle Tree Road, Holgate, via Gosford.
Wagga Experiment Farm, Wagga.
Waterfall Sanatorium, Waterfall.
White, A. N., Blakeney Stud, Orange.
Williams, G. R. B., " Gwandalan," Grenfell.
Wollongbar Experiment Farm, Wollongbar.
Yanco Agricultural High School.

Herds Other than Registered Stud Herds.

114 A.G.H., Kenmore.
Bathurst Gaol, Bathurst.
Brookfield Afforestation Camp, Mannus.
Callan Park Mental Hospital, Callan Park, Rozelle.
Emu Plains Prison Farm.
Glen Innes Prison Camp, Glen Innes.
Gosford Farm Home for Boys, Gosford.
Goulburn Reformatory, Goulburn.
Higgins, J. P., " Koranga," Camden.
Lidcombe State Hospital.
Morisset Mental Hospital, Morisset.
Orange Mental Hospital.
Parramatta Gaol, Parramatta.
Parramatta Mental Hospital.
Peat and Milson Islands Mental Hospital, Hawkesbury River.
Stockton Mental Hospital.

Abortion-free Herds.

THE following herds have been declared free of contagious abortion (Bang's disease) in accordance with the requirements of the scheme of certifying herds abortion-free :—

Owner and Address.	Number in herd.
Registered Stud Herds.	
Armstrong, K. A., " Heathfield," Boorowa	23
Bathurst Experiment Farm (Guernseys)	28
Cowra Experiment Farm (Ayrshires)	55
Department of Education—Farm Home for Boys, Mittagong (A.I.S.)	54
Dixson, R. C., " Elwatan," Castle Hill (Jerseys) ...	22
Fairbairn & Co., C. P., Woomargama (Beef Shorthorns)	173
Farrer Memorial Agricultural High School, Nemingha (A.I.S.)	44
Forster, N. L., Abington, Armidale (Aberdeen-Angus)...	167
Hann, O., " Bomerah," Barrington (Jerseys)	42
Hawkesbury Agricultural College, Richmond (Jerseys)...	96
Hicks Bros., " Meryla," Culcairn	65
Hill, E. Pritchard, Bowling Alley Pt. (Jerseys) ...	96
Hurlstone Agricultural High School, Glenfield (Ayrshires)	53
Killen, E. L., Pine Park, Mumbil	141
McEachern, H., Tarcutta (Red Poll)	61
McSweeney, W. J., " The Rivers," Canowindra (Beef Shorthorns)	95
Martin Bros., " Narooma," Urana-road, Wagga (Jerseys)	160
Navua Stud Farm, Grose Wold, via Richmond (Jerseys)	101
New England Experiment Farm, Glen Innes (Jerseys)...	46
Peel River Land & Mineral Co., Tamworth (Beef Shorthorns)	100
Raper, F. S., Calool, Culcairn	80
Riverina Welfare Farm, Yanco	135
Scott, A. W., " Milong," Young (Aberdeen-Angus) ...	474
Simpson, F. S., " Gunnawarra," Gulargambone (Beef Shorthorns)	150
Training Farm, Berry	118
Trangie Experiment Farm, Trangie (Aberdeen-Angus)...	155
Wagga Experiment Farm, Wagga (Jerseys)	47
Walker, Jas. R., " Strathdoon," Wolseley Park (Red Polls)	37
White, F. J., and Sons, Bald Blair, Guyra (Aberdeen-Angus)	152
Whitelaw, L. A., " Wendouree," Merriwa (Beef Shorthorns)	79
Wollongbar Experiment Farm (Guernseys)	110
Young, A., " Rocklynne," Cudal (Polled Beef Shorthorns)	27
Herds Other than Registered Stud Herds.	
114 A.G.H. Kenmore	66
Callan Park Mental Hospital	45
Department of Education—Farm Home for Boys, Gosford	37
Fairbridge Farm School, Molong	42
Forster, N. L., and Sons, " Abington," Armidale ...	62
Morisset Mental Hospital	66
New England University College, Armidale	20
Orange Mental Hospital	61
Peat & Milson Islands Mental Hospital	24
Royal Prince Alfred Hospital, Camperdown, " Yaralla " Herd	94
Rydalmere Mental Hospital, Rydalmere	57
Salway, A. E., Cobargo	62

MAX HENRY, Chief of Division of Animal Industry.

Tubercle-free Herds.

THE following herds have been declared free of tuberculosis in accordance with the requirements of the scheme of certifying herds tubercle-free, and, unless otherwise declared, this certification remains in force until the date shown in respect of each herd :—

Owner and Address.	Number Tested.	Expiry Date.
Registered Stud Herds.		
Armstrong, K. R., "Heathfield," Boorowa ...	23	18/12/46
Bathurst Experiment Farm (Guernseys) ...	28	12/10/46
Berry Training Farm, Berry (A.I.S.)	129	16/10/46
Bradley, H. F., "Nardoo," Ashford Road, Inverell (Jerseys)	40	13/4/47
Campbell, L. W., "Dunmallard," Fern Hill Road, Inverell (Jerseys)	39	21/7/47
Cattell, E. J., "Kapunda," Rob Roy, Inverell (Jerseys)	121	30/6/47
Chegwidden, E., "Austral Park," Berry (Jerseys)	88	14/1/47
Christian Bros. Novitiate, Mt. St. Joseph, Minto	29	15/7/47
Coote, B. N., Auburn Vale Road, Inverell (Jerseys)	85	23/7/47
Cowra Experiment Farm (Ayrshires)... ...	56	5/7/47
Department of Education, Yanco Agricultural High School (Jerseys)	64	1/3/47
Dixon, R. C., Elwatan, Castle Hill (Jerseys)...	29	5/3/47
Fairbairn, C. P. Woomargama	173	17/3/48
Farm Home for Boys, Mittagong (A.I.S.) ...	59	2/8/48
Farrer Memorial Agricultural High School, Nemingah (A.I.S.)	44	28/8/47
Forster, N. L., Abington, Armidale (Aberdeen-Angus)	167	24/5/48
Frater, A. D., King's Plain Road, Inverell (Guernseys)	107	11/4/47
Freudenstein, W. G. A. & F. J., "Chippendale," Grenfell Road, Young (Beef Shorthorns)	49	15/1/47
Hann, O., Bomerah, Barrington	55	8/8/47
Hawkesbury Agricultural College, Richmond (Jerseys)	119	19/3/47
Hurlstone Agricultural High School, Glenfield (Ayrshires)	53	12/8/48
Kahlua Pastoral Co., "Kahlua," Coolac (Aberdeen-Angus)	257	30/11/47
Killen, E. L. "Pine Park," Mumbil (Beef Shorthorns)	261	25/9/46
Knight, G., Tannabah, Coonabarabran ...	60	30/11/46
Lidcombe State Hospital and Home (Friesian)	111	3/10/46
Limond Bros., Morisset (Ayrshires)	64	26/4/47
McGarvie Smith Animal Husbandry Farm, Liverpool (Jerseys)	72	22/2/47
Martin, W. W., "Narooma," Urana Road, Wagga (Jerseys)	160	11/7/46
Navua Stud Farm, Grose Wold, via Richmond (Jerseys)	120	8/10/47
New England Experiment Farm, Glen Innes (Jerseys)	46	18/3/47
Newman, G. H., "Bunnigalore," Belanglo (Jerseys)	38	2/12/46
Peel River Land and Mineral Co., Tamworth (Poll Shorthorns)	110	16/10/46
Raper, W. R., Calool, Culcairn (Beef Shorthorns)	86	12/2/47
Reid, D. B., "Evandale," Sutton Forest (Aberdeen-Angus)	61	23/11/47
Riverina Welfare Farm, Yanco (Jerseys) ...	130	26/6/46
Scott, A. W., "Milong," Young (Aberdeen-Angus)	114	11/6/46
Simpson, F. S., "Gunnawarra," Gulargambone (Beef Shorthorns)	167	19/11/47
Trangie Experiment Farm, Trangie (Aberdeen-Angus)	155	11/3/47
Wagga Experiment Farm (Jerseys)	15	1/2/47
Wallaga Lake Aboriginal Station	19	29/4/47
White, H. F. Bald Blair, Guyra (Aberdeen-Angus)...	300	20/4/47
Wollongbar Experiment Farm (Guernseys) ...	110	16/3/47
Young, A., "Daylesford," Cudal (Beef Shorthorns)	23	25/2/47
Herds Other than Registered Stud Herds.		
114 A.G.H., Kenmore	48	26/6/46
Aboriginal Station, Brewarrina	14	20/5/46
Aboriginal Station, Wallaga Lake	19	29/2/46
Australian Missionary College, Cooranbong ...	100	30/8/47
Barnardo Farm School, Mowbray Park ...	53	18/7/47
Brookfield Afforestation Camp, Mannus ...	197	12/7/47
Cameron, N., Montrose, Armidale (late New England Girls School)	33	20/2/47
De Fraine, A. N., Reservoir Hill, Invere ...	21	8/6/47
Department of Education, Gosford Farm Home	37	26/2/47
Ehsman Bros., Inverell	39	29/8/48
Emu Plains Prison Farm	115	29/1/47
Fairbridge Farm School, Molong	25	9/7/47
Forster, N.L., and Sons, "Abington," Armidale	62	24/5/48
Foy, F. J., The Valley Farm, Megalong Valley	25	18/12/47
Frizelle, W. J., Rosenstein Dairy, Inverell ...	134	16/8/47
Goulburn District Hospital	5	6/11/46
Goulburn Reformatory, Goulburn	7	27/6/47
Grant, W. S., "Monkittee," Braidwood ...	23	29/4/47
Hannaford, A., Braidwood	10	1/2/47
Harcombe, F. C., Hillcrest Farm, Warialda Road, Inverell	53	10/4/47
Hunt, F. W., Spencers Gully	27	16/2/47
Koyong School, Moss Vale	2	5/3/47
Lott, J. H., "Bellevue," Rob Roy, Inverell...	41	26/6/47
Lunacy Department, Callan Park Mental Hospital	43	4/4/47
Lunacy Department, Gladesville Mental Hospital	20	15/4/46
Lunacy Department, Morisset Mental Hospital	79	8/3/47
Lunacy Department, Parramatta Mental Hospital	62	26/7/47
Lunacy Department, Rydalmere Mental Hospital	57	30/10/46
McGufficke, J. O., "Lovely Bank," Rob Roy, Inverell	33	25/6/47
McLane, R. G. P., Ibis Valley, Swanbrook ...	24	23/5/47
Morris, S. W., "Dunreath," Swanbrook Rd., Inverell	51	23/5/48
Murray, J. A., "The Willows," Keiraville ...	21	8/8/46
New England University College, Armidale ...	19	1/5/47
Orange Mental Hospital	63	19/3/47
Parker Bros., Hampton Court Dairy, Inverell	125	25/8/47
Peat and Milson Islands Mental Hospital ...	24	2/9/47
Reid, G. T., "Narrengullen," Yass	167	14/7/46
Richardson, C. E. D., Kayuga Road, Muswellbrook	78	3/7/47
Rolfe, V. J., "Mount View," Inverell ...	18	9/2/47
St. Ignatius' College, Riverview	24	7/7/47
St. John's College, Armidale	11	20/2/47
St. Joseph's Orphanage, Kendall Grange, Lake Macquarie	9	11/6/47
St. Michael's Orphanage, Baulkham Hills ...	40	4/6/47
St. Patrick's Orphanage, Armidale	10	15/11/46
St. Vincent's Boys' Home, Westmead ...	33	9/7/48
State Penitentiary, Long Bay	13	30/11/47
Stephenson, W. J., "Hill View," Fig Tree ...	53	1/2/47
The Sydney Church of England Grammar School, Moss Vale	48	18/12/47
Turnbull, J. M., "Pastime," Kayuga Road, Muswellbrook	85	20/3/47
Weidman, A. B., No. 2 Dairy, Aberdeen Road, Muswellbrook	68	3/9/46
Weidman, A. B., No. 3 Dairy, Kayuga Road, Muswellbrook	38	6/9/46
Weidman, A. B., No. 4 Dairy, Kayuga Road, Muswellbrook	57	2/11/46
William Thompson Masonic School, Baulkham Hills	54	10/6/47
Wilson, A. G., "Blytheswood," Exeter ...	66	23/4/47
Wilton, C., Bligh Street, Muswellbrook ...	54	12/5/46
Youth Welfare Association of Australia ...	162	26/4/47

Tubercle-free Herds—*continued.*

Tubercle-free Areas.

THE following Areas have been declared tubercle-free and no cattle are allowed to be kept therein unless subjected to the tuberculin test and found free from tuberculosis :—

Bombala Area.
Inverell Area.
Braidwood Area.
Municipality of Muswellbrook.
Municipality of Queanbeyan.

MAX HENRY, Chief Division of Animal Industry.

A.I.S. Cattle Purchased for Grafton Experiment Farm Stud.

AN Australian Illawarra Shorthorn bull "Alfa Vale Douglas" and six heifers have been purchased from Camelot Stud, Penrith, by the Department of Agriculture for its A.I.S. Stud at Grafton Experiment Farm.

The Minister for Agriculture (Hon. E. H. Graham, M.L.A.) said that he had given instructions to purchase these animals in order to build up and maintain at a high standard, his Department's Australian Illawarra Shorthorn Stud at Grafton Experiment Farm.

A bull ("Alfa Vale Monition") purchased some years ago from Mr. G. F. Shirley's Camelot Stud for Grafton Farm had proved highly successful as a herd sire. Many breeders considered "Monition" the best A.I.S. bull in Australia to-day.

The animals now purchased, said Mr. Graham, represented a successful blending of "Greyleigh" "Alfa-Vale" and other popular high testing strains of Australian Illawarra Shorthorns. Animals of this line of blood should provide excellent material on which to build the future of the Grafton Stud.

"Alfa Vale Douglas" was a young bull of high quality, said the Minister. His breeding and the test records of his forebears pointed to his being a worthy successor to "Monition."

"Alfa Vale Douglas" was by "Alfa Vale Pat" from "Alfa Vale Model 16th" which holds an Australian production record for a senior two-year-old—1,700 lb. butter (with allowances) in two lactation periods.

The females purchased were "Camelot Beauty 2nd" (by "Alfa Vale Monition" from "Camelot Beauty"), "Camelot Beauty 5th" (by "Alfa Vale Douglas" from "Camelot Beauty"), "Camelot Mayflower 5th" (by "Alfa Vale Douglas" from "Greyleigh Mayflower 44th"), "Camelot Mossrose 4th" (by "Alfa Vale Douglas" from "Camelot Mossrose 2nd"), "Camelot Lucy" (by "Alfa Vale Douglas" from "Tabbagong Lucy 14th"), and "Camelot Opal 6th" (by "Alfa Vale Monition" from "Camelot Opal 4th").

Field Day at Shannon Vale Nutrition Station.

A FIELD day was held at Shannon Vale Nutrition Station (near Glen Innes) on 12th September.

In an invitation to New England graziers and other interested persons to attend, the Minister for Agriculture (Hon. E. H. Graham, M.L.A.) said that results obtained at Shannon Vale had gone far towards solving the problems of graziers running sheep on granite country on the eastern slopes of New England Tableland.

It had been established that high mortality on these granite pastures had been due to malnutrition, sheep being forced to exist throughout the colder months on frost-bitten, innutritious pasture which provided only a starvation diet.

Sown pastures, to supplement natural grazing, had to-date proved the most satisfactory solution of this problem, said Mr. Graham. Common salt and dicalcic phosphate had been tried for some years, but resulted in no apparent improvement in health or condition. Supplementary hand feeding of concentrates proved most uneconomical.

Over a period of five years, sheep grazed on improved pasture for five days per week throughout the winters produced 15.8 lb. more wool per acre than sheep on natural pasture. On the Station were sheep 9½ years old which had survived eight years on New England. They had good mouths, and last year had cut 9.32 lb. wool. Their condition to-day would warrant a sale price showing much less depreciation from purchase price than was usual with bought wethers at that age.

The foregoing results had been obtained with dry sheep, and had established a firm basis for the second phase of the Nutrition Station's investigations, which dealt with breeding of sheep on eastern New England granite country. Those investigations were now in their second year, and covered behaviour of pregnant ewes, their weaners, and two-tooths.

EDITORIAL—

Minister Goes Abroad

To Lead Stock Delegation.

AS recently announced by the Premier, the Minister for Agriculture (Hon. E. H. Graham, M.L.A.), is to leave this month to join and lead the New South Wales stock delegation which is already in the United Kingdom. In addition to the Minister, the delegation includes three stock specialists of the Department of Agriculture and four leading private breeders.

Although the main aim of the delegation is to buy high-grade beef and dairy cattle. sheep, pigs, goats and a percheron stallion. the decision to send the Minister for Agriculture as leader—a Minister who is also one of the State's foremost breeders—broadens the mission's scope and increases immensely its potential for greater benefits to this State—not only to the livestock industries but to agriculture as a whole.

A stock-buying delegation led by a Minister of the Crown can become a mission of goodwill designed to cement together the common interests of Australian stock breeders and those of the countries visited—United Kingdom, United States of America and Canada. With the Government's choice of Mr. Graham to lead and carry through such a mission primary producers in New South Wales will heartily agree.

Australia is so vitally dependent on export markets for disposal of her livestock products—beef, mutton, lamb, pigmeats, butter, wool, etc.—that it would be difficult to over-estimate the advantages which will accrue from frank and open interchange of ideas between practical stockmen of the countries concerned. These benefits will be among the most important and lasting results of the delegation's overseas visit. Implementation of those results will be facilitated by the Minister's participation.

Further, it may be assumed that the delegation as now constituted will be afforded freer access to, and perhaps more frankness of discussion with, authorities who direct and mould their country's internal and external economies, and who are therefore in a position to put a finger on any shortcomings in Australia's export programme.

It seems that in the absence of such knowledge, wise choice of the types of animals which the delegation aims to purchase would be difficult. That choice has to satisfy two requirements—improvement of our herds and flocks, but also (so far as the products of those flocks and herds are concerned), the oftentimes exacting demands of consumers in other countries.

Seed Wheat for 1947 Planting.

THE Minister for Agriculture (Hon. E. H. Graham, M.L.A.), has announced that arrangements to supply seed wheat for planting next season (1947) have received further consideration by the Department and the Australian Wheat Board. Growers are permitted to purchase seed from the forthcoming harvest direct from growers.

Crops in various parts of the State would at least yield sufficiently well to supply, in part, seed wheat requirements of those districts, said the Minister. Purchase of seed wheat from growers in those areas could be arranged privately and at whatever price was decided upon by purchaser and seller. In all cases, however, an application should be made by the purchaser to the Australian Wheat Board, 16-18 O'Connell Street, Sydney, stating his name and the quantity required.

The price at which seed wheat was purchased was a matter of agreement between the purchaser and seller, therefore the price of the seed wheat need not be mentioned in the application for the permit. Growers would understand from this that it was an outright sale and no certificate would be issued for the wheat concerned.

Growers had previously been advised of the procedure necessary to secure supplies of F.A.Q. wheat and, in some cases, premium wheat from stacks of 1945-46 wheat, said the Minister. That wheat would still be available where insufficient quantities of new season's wheat were not available for a district's requirements.

The position in regard to stacks at which wheat should be retained, said Mr. Graham, was being constantly reviewed so as to ensure, as far as possible, that seed wheat in sufficient quantity would be available where no new season's seed was harvested.

In addition to the foregoing, limited quantities of approved seed would be available from approved growers whose names would be recorded in the January, 1947, issue of the *Agricultural Gazette*. Intending purchasers should make direct contact with vendors, and complete arrangements for supply and purchase.

Films on Sheep-Raising to be Screened in Northern Centres.

ARRANGEMENTS have been made, in association with the Australian Wool Board, for the screening at a number of centres in the northern part of the State of films prepared by the Board in connection with the sheep industry. The subjects dealt with are worm parasites, blowfly crutch strike, hydatids, branding and drought feeding.

The films are well worthy of study by sheep-raisers and others interested in live stock industries. A departmental officer will be present at each screening and, at the conclusion of the programme, will be available to answer questions on the subjects dealt with. Admission will be free.

The dates on which the films will be shown at the various centres are as follows:—

November 11.—Moree (Town Hall, 7.30 p.m.).

November 12.—Collarenebri (Town Hall, 3 p.m.).

November 12.—Walgett (School of Arts, 8 p.m.).

November 13.—Carinda (Theatre, 8 p.m.).

November 14.—Pilliga.

November 15.—Narrabri (Town Hall, 2.30 p.m.).

November 15.—Wee Waa (School of Arts, 7.30 p.m.).

November 18.—Boggabri (Theatre, 3 p.m.).

November 18.—Gunnedah (Town Hall, 8 p.m.).

November 19.—Quirindi (Theatre, 3 p.m.).

November 19.—Tamworth (Town Hall, 8 p.m.).

November 20.—Nundle (Memorial Hall, 8 p.m.).

November 21.—Manilla (Theatre, 3 p.m.).

November 21.—Barraba (Theatre, 8 p.m.).

November 22.—Bingara (Theatre, 2.30 p.m.).

November 22.—Gravesend (8 p.m.).

November 25.—Warialda (Memorial Hall, 2 p.m.).

November 25.—Delungra (School of Arts, 8 p.m.).

November 26.—Inverell (Town Hall, 8 p.m.).

November 27.—Emmaville (Theatre, 2 p.m.).

November 28.—Tenterfield (Lyric Theatre, 2 p.m.).

November 29.—Deepwater (Theatre, 2 p.m.).

December 2.—Glen Innes (Town Hall, 7.30 p.m.).

December 3.—Guyra (Oddfellows Hall, 8 p.m.).

December 4.—Bundarra (Theatre, 8 p.m.).

December 5.—Armidale (Town Hall, 8 p.m.).

December 6.—Uralla (Oddfellows Hall, 8 p.m.).

December 7.—Walcha (Oddfellows Hall, 8 p.m.).

Further particulars may be obtained from Inspectors of Stock for the centres at which the films are to be shown.

NEW SELECTIVE WEEDICIDES.

A. PEARSON, H.D.A., Weeds Officer.

NUMEROUS inquiries have recently been received by the Department in regard to the new hormone type selective weedicides, variously termed as T.C.P., 2,4-D., M.C.P.A., D.C.P.A., and D.C.P.

None of these materials is, as yet, on the market in Australia, but small quantities of M.C.P.A. (which is chemically sodium 4 chloro 2 methyl phenoxyacetate) and 2,4-D or D.C.P.A. (chemically dichlorophenoxyacetic acid) have been obtained for experimental purposes, since it appears that they may be marketed here within a few months.

The effect of these products on local weeds and the price at which they are sold will determine their use in this country, but the present indications are that they will be valuable for killing some weeds which are troublesome to farmers and graziers as well as for weed control in lawns, golf courses and bowling greens.

M.C.P.A. was developed in England and all preliminary investigational work in connection with it was carried out in that country, while the investigational work and commercial development of 2,4-D has taken place in the United States of America.

These new hormone type selective weedicides upset the metabolism of plants and are comparatively slow acting. The first result seen is a contortion and twisting of the affected plants.

English Experience.

The M.C.P.A. received for experimental purposes is in the form of a 1 per cent. dust and as a 10 per cent. solution. Overseas results indicate that the normal application of the 1 per cent. dust for susceptible weeds is 2 cwt. per acre, while more resistant weeds require 3 or 4 cwt. per acre. The 10 per cent. solution is normally diluted at the rate of 1 gallon of solution to 100 gallons of water thus giving a concentration of 1 in 1,000. It is applied as a spray at the rate of 100 to 200 gallons per acre.

English results indicate that this product will give control of plants such as Yellow Charlock, Fat Hen, Chick Weed, Bindweed, Spurrey, Box Sorrels, Polygonum species, nettles etc.

An English Photograph showing Eradication of White Charlock (Wild Radish) from a Cereal Crop, by the Use of M.C.P.A.

[Imperial Chemical Industries photograph.

American Photograph showing Eradication of Lambs' Tongue. by the Use of 2.4-D, Without Damage to Grass.

[*U.S.A. Dept. of Agriculture photograph.*

Susceptible and Resistant American Weeds.

In California the group of weedicides known as 2,4-D is marketed under at least sixteen names. These Commercial preparations vary in content from 9.6 per cent. to 70 per cent. dichlorophenoxy—Acetic acid. The University of California, from preliminary tests, has listed certain plants as susceptible and others as resistant to the effects of 2,4-D. These are as under:—

Susceptible.

Austrian field cress.	Knotweed.
Blue lettuce.	Lambs'-quarters.
Bur-reed.	Milk thistle.
Buttercup.	Mustards.
California mugwort.	Oxalis (green).
Canada thistle.	Pennywort.
Cattail.	Plantain.
Cheese-weed.	Poison hemlock.
Chicory.	Prostrate pigweed.
Creek nettle.	Purslane.
Dandelion.	Red clover.
Fanweed.	Rough pigweed.
Fennel.	Sheep sorrel.
Golden rod.	Shepherd's purse.
Hoary cress (lens-podded).	Sow thistle.
Horsetail.	Spotted spurge.
Indian strawberry.	Sweetclover.
Kelp.	Tules.
Klamath weed (St. Johns wort).	Tumbling pigweed.
	Water hyacinth.
	Water primrose.
Western ragweed.	Willow.
Wild morning-glory.	Yarrow.
Wild raddish.	Yellow star thistle.

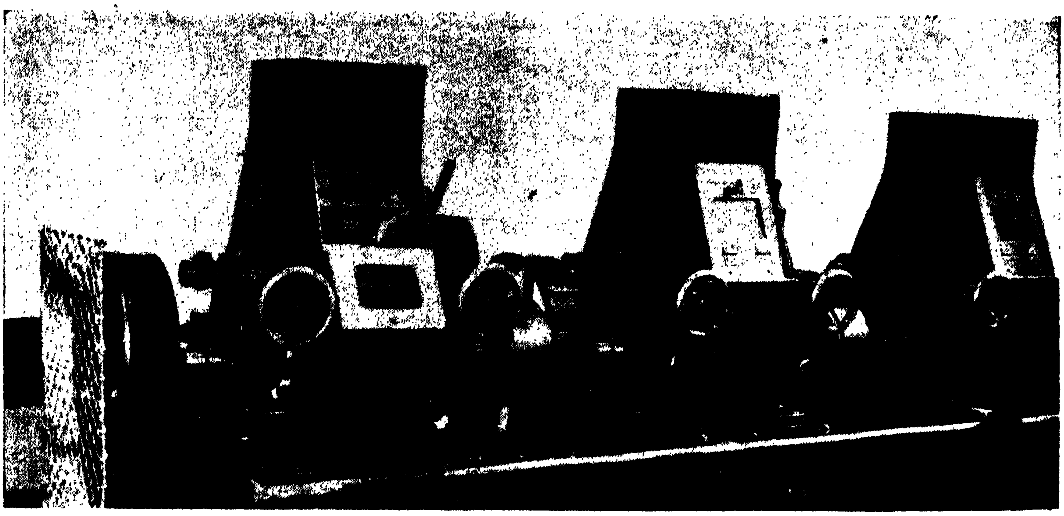
Resistant.

Alkali mallow.	Mayweed.
Annual bluegrass.	Oxalis (red).
Baby tears.	Pineapple weed.
Bermuda grass.	Poison oak.
Blackberry.	Quackgrass.
Bluegrass.	Ripgut grass.
Button willow.	Russian knapweed.
Crabgrass.	Saltbush.
Foxtail.	Soft chess.
Goosegrass.	Watergrass.
Italian ryegrass.	Wild oats.
Johnson grass.	

The common names enumerated above are not identical in all cases with Australian common names of plants, but the list gives indication of the type of plant which these weed-killers could be expected to effect.

Time of Application.

All available information indicates that weeds should be sprayed while they are still young and growing vigorously. In general, plants that form rosettes are stated to be particularly susceptible to these weedicides, while grasses are much more resistant to the spray than are broad-leaved plants.



A Section of the Department of Agriculture's Experimental Mill.

ANALYSIS OF THE NEW SOUTH WALES F.A.Q. WHEAT
FOR THE SEASON 1945-46.

J. R. FISHER, B.Sc.Agr, H.D.A., Chemist.

ALTHOUGH the rainfall was below average in many wheat-growing areas during the growing period of the 1945-1946 crop, the incidence of the falls was such that the crops received the maximum benefit, so that in some localities high crop yields were obtained on rainfall considerably below the average.

Analysis of the wheat and flour shows that the general quality is slightly lower than that of the previous season's crop, but that a satisfactory loaf can be baked from the flour.

The samples of wheat examined, representative of the grain harvested from the 1945-1946 New South Wales crop, were obtained for analysis by courtesy of the Sydney Chamber of Commerce.

The proportion of grain received from each of the three wheat-growing areas of the State was as follows:—

	Bulk Wheat.	Bagged Wheat.
	Per cent.	Per cent.
Wheat from Northern areas	15	24
Wheat from Western areas	40	58
Wheat from Southern areas	45	18

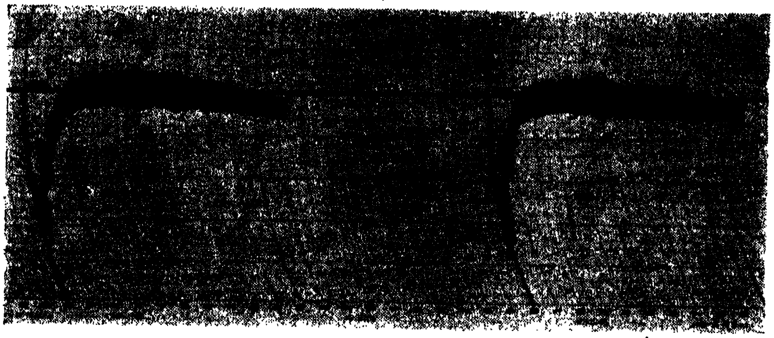
General Character of the Grain.

The grain was of good, bright, general appearance, and on the whole was well-filled, although a few pinched grains were present in each of the samples; no bleaching or weather damage was evident. The bulk F.A.Q. sample contained approximately 10 per cent. of vitreous grains and the bagged F.A.Q. sample contained approximately 2 per cent.

Dockage.

The amount of dockage as determined by means of a 2 mm. slotted sieve is shown below:—

Sample.	Total dockage, including broken and pinched grain, wild and domestic oats, straw dust, etc.	Broken and pinched grains.
	Per cent.	Per cent.
Bulk F.A.Q.	6·6	6·2
Bagged F.A.Q.	5·4	5·2



Farinograms of 1945-46 F.A.Q. Wheat.
Left.—Bulk sample.
Right.—Bagged sample.

Milling Results and Analytical Data on the Wheat.

The figures set out in Tables 1 and 2 indicate that the protein content of 1945-1946 New South Wales F.A.Q. wheat is lower than that of F.A.Q. wheat from the 1944-1945 crop. The protein content of the 1945-1946 bulk F.A.Q. sample is 0.7 per cent. lower than that of bulk F.A.Q. wheat from the 1944-1945 crop, whilst the bagged F.A.Q. sample shows a decrease of 0.6 per cent. protein compared with 1944-1945 bagged F.A.Q. grain.

Table 1.—Analysis of the Grain.

Sample.	Declared bush. weight. Louis Schopper.	Bushel weight clean wheat. Franklin.	Moisture content.	Flour Yield.*	Milling Quality.	Pelshenke Time.	Nitrogen.	Protein (N x 5·7).
	lb.	lb.	Per cent.	Per cent.		Minutes.	Per cent.	Per cent.
Bulk F.A.Q.	63½	63½	12·1	74·2	Excellent.	45	2·04	11·63
Bagged F.A.Q. ...	63½	63½	11·8	74·6	do	58	2·00	11·40

* Includes 2·5 per cent. of low grade flour that is not used in the flour tests.

Table 2.—Analysis of the Flour.

Sample.	Nitrogen.*	Protein (N. x 5·7).*	Ash.	Gluten content. Wet.	Gluten content. Dry.	Gluten Quality.
	Per cent.	Per cent.	Per cent.	Per cent.	Per cent.	
Bulk F.A.Q.	1·78	10·15	0·44	32·6	10·3	Good.
Bagged F.A.Q.	1·74	9·92	0·44	31·0	9·8	do
Bulk F.A.Q. 1944-45 ...	1·96	11·17	0·49	35·3	11·4	do

* Results expressed on 13·5 per cent. moisture basis.

The decrease in the protein content of the grain from the 1945-1946 season's crop, compared with grain of the 1944-1945 crop was to be expected, having regard to the high average yields obtained throughout the State. Although in many wheat-growing areas the rainfall was below average, the incidence of the falls was such that the crops received the maximum benefit, so that in some localities high crop yields were obtained on rainfall considerably below the average. Rust damage was experienced in some areas in which abundant rainfall was received during the growing period of the crops.

Table 3.—Farinograph Data.

	1944-45 F.A.Q. Bulk.	1944-45 F.A.Q. Bagged.	1945-46 F.A.Q. Bulk.	1945-46 F.A.Q. Bagged.
Water absorption ...	62·8 per cent.	61·0 per cent.	60·1 per cent.	59·0 per cent.
Dough development time	6½ mins.	4½ mins.	4½ mins.	4 mins.
Dough stability	2½ mins.	1½ mins.	3 mins.	2½ mins.
Dough weakening in Brabender units in 10 minutes	20 units	45 units	15 units	15 units
Width of band at optimum consistency ...	65 units	70 units	70 units	65 units

Results of the Farinograph tests, which are set out in Table 3, provide further evidence that the general quality of 1945-1946 F.A.Q. wheat is slightly inferior to wheat from the 1944-1945 season's harvest.

The Farinograph curves show that both bulk and bagged F.A.Q. samples are not so well balanced in their gluten characteristics as the samples from the 1944-1945 crop;

both samples from the current season's crop are inclined to be tough and would not be expected to produce a good mellow dough, possessing ample oven spring, in the bakehouse.

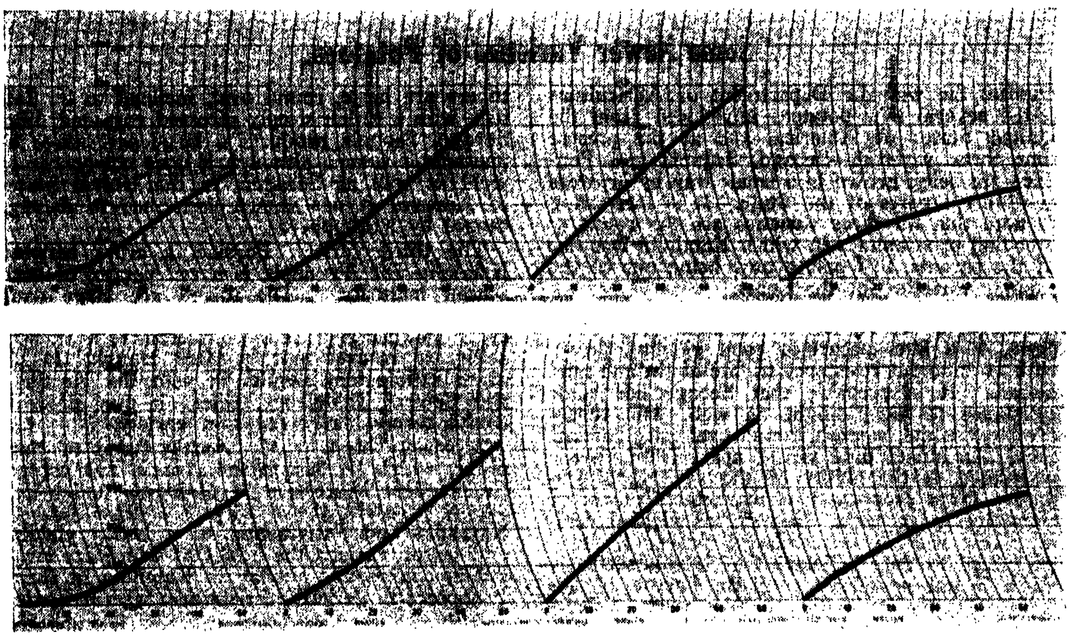
Table 4.—Fermentograph Data.

	1944-45 F.A.Q.		1945-46 F.A.Q.	
	Bulk.	Bagged.	Bulk.	Bagged.
	c.c.	c.c.	c.c.	c.c.
Gas produced in 1st hour ...	245	260	290	300
Gas produced in 2nd hour ...	440	430	440	420
Gas produced in 3rd hour ...	595	585	490	470
Gas produced in 4th hour ...	490	335	240	280
Total	1,770	1,610	1,460	1,470

Table 5.—Baking Results.

Sample and Procedure.	Water Absorption.	Loaf Volume.	Symmetry. (Max. 10.)	Crust Colour. (Max. 10.)	Crumb texture. (Max. 10.)	Crumb Colour. (Max. 10.)	Handling Quality.
	Per cent.	c.c.					
Bulk F.A.Q.—M.P.	56·0	495	8	9	9	8	Fair to good.
Bulk F.A.Q.—M.P.B.	56·0	530	8	9½	9	8	do
Bagged F.A.Q.—M.P.	55·0	505	8	9	9	8	do
Bagged F.A.Q.—M.P.B.	55·0	510	8	9	9	8	do

M.P. = Malt-phosphate Procedure.
M.P.B. = Malt-phosphate-bromate Procedure.



Fermentograph Charts of 1945-46 F.A.Q. Wheat.
Upper.—Bulk sample. *Lower.*—Bagged sample.

Results of Fermentograph tests, set out in Table 4, indicate that the gassing power of the flour is lower than that of 1944-1945 F.A.Q. wheat; gassing power of wheat from the 1944-1945 crop, however, was higher than might have been expected. The relatively low gassing power of flour from the current season's wheat can probably be attributed to the absence of extensive rain after the crop had reached maturity.

There is no significant difference in the gassing power of the bulk and bagged F.A.Q. samples.

The chemical and physical data on the flour are confirmed in the baking tests; the doughs were inclined to be tough, and did not possess as much elasticity as desirable, although fundamentally gluten quality is similar to that of flour from 1944-1945 F.A.Q. wheat.

The loaves are of satisfactory appearance with good crust colour and crumb texture, but loaf volumes are slightly inferior to those of loaves baked from the 1944-1945 F.A.Q. samples.

Summary.

The general quality of the 1945-1946 F.A.Q. wheat has been determined by milling tests, chemical analysis and Farinograph, Fermentograph and baking tests.

Chemical analyses show that the protein content of 1945-1946 F.A.Q. wheat is lower than that of wheat from the 1944-1945 season's crop; the protein content is 0.7 per cent. lower in the instance of bulk F.A.Q. wheat, and 0.6 per cent. lower in respect of the bagged F.A.Q. sample.

The Farinograph tests show that the flour is inclined to be tough, and does not possess as much gluten elasticity as desirable, although fundamentally gluten quality is similar to that of flour from 1944-1945 F.A.Q. wheat.

Fermentograph tests show that gassing power of the flour is lower than that of flour from 1944-1945 F.A.Q. wheat, and baking tests indicate that a satisfactory loaf can be made from the flour, although the general baking quality is slightly inferior to that of flour from 1944-1945 season's crop.

Some Newer Varieties of Potatoes.

DURING the war the Department of Agriculture tested several new potatoes introduced from the United States of America, and at the present time three varieties—Sebago, Sequoia and Pontiac—are being grown in a small way by growers in different parts of the State. It is interesting to note that all three varieties are the result of breeding programmes in which Katahdin was one of the parents, this potato now being one of the popular varieties for the Coast.

Sebago, a cross between Katahdin and Chippewa, is a late maturing, good yielding potato with an inherent resistance to late blight and mild mosaic. It is probable that Sebago has some resistance to early blight as well. The tubers are clear white, smooth, round oval with shallow eyes. An outstanding virtue, apart from disease resistance, is the ability of the variety to produce a large proportion of marketable tubers of attractive appearance. Sebago has yielded comparatively well in departmental trials; in fact, its record to date indicates that it will seriously rival, if not completely replace, Factor as our main crop variety within a few years. Sebago because of its resistance to late blight, may prove a valuable potato in districts such as Dorrigo and Ebor.

Sequoia, a cross between Katahdin and Green Mountain, is a vigorous late-maturing white skin potato, reputedly resistant to late blight. The tubers are large, round oval, inclined to be flattish, with a rather deeply recessed rose end. Like Sebago, Sequoia produces a large percentage of marketable tubers, although it does not appear to yield as well as Sebago. In the United States of America it has shown resistance to damage caused by leafhoppers.

The third variety, Pontiac, a cross between Katahdin and Triumph, is a red potato, of mid-season maturity. The tubers are large oval, smooth, with a large number of well distributed eyes. Pontiac appears to be tolerant to heat, with ability to recover quickly after drought. It has given satisfactory results in both the Northern and Central Tablelands, where it may prove a useful second early red skin variety.

A variety bred by Mr. Austin Price, of Bannister, which he has named Aussie, has created an excellent impression at Maitland, under irrigation. Aussie, the result of a cross between Katahdin and Satisfaction, is a heavy yielding mid-season variety, the tubers of which are large, red in colour, and similar to Katahdin in shape. It appears to do best when grown with irrigation.

Although seed of these varieties is unprocurable at present, it is anticipated that a limited quantity of each will be available in Tableland districts next season, and interested growers are referred to in the Potato Growers' Association in the various districts in regard to supply.—A. C. ORMAN, Special Agricultural Instructor.

Agricultural Societies' Shows.

SECRETARIES are invited to forward for insertion in this list dates of their forthcoming shows; these should reach the Editor, Department of Agriculture, Box 36A, G.P.O., Sydney, not later than the 15th of the month previous to issue. Alteration of dates should be notified at once.

1946.

Bangalow .... November 12, 13

1947.

Queanbeyan (D. Vest) .... February 21, 22

Tumut .... March 4, 5

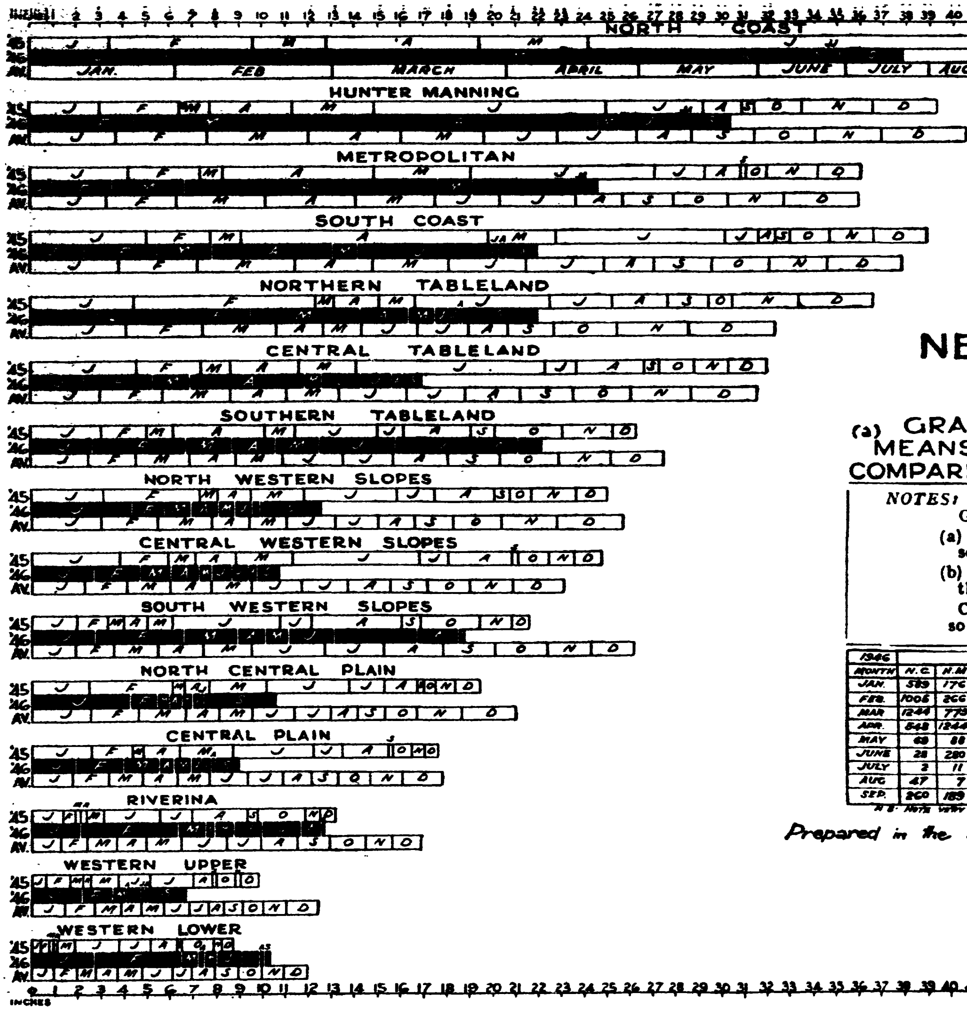
Newcastle (P. G. Legoe) .. February 19, 20, 21, 22

Jingellic (A. G. McVean) .... March 5

RAINFALL IN NEW SOUTH WALES

(Published Quarterly)

(a) GRAPH SHOWING DIVISIONAL MEANS EACH MONTH FOR 1945 AND 1946 COMPARED WITH THE (b) AVERAGES FOR ALL YEARS.



NOTES:

Graph based on data supplied by Sydney Weather Bureau.

(a) "means" are averages of rainfall recorded each month at selected centres in each particular division.

(b) "averages" represent the normal rainfall or an average of the recorded monthly means for all years.

Current year's rainfall shown thus: ▬; and the figures so represented (in points) are indicated in the schedule below:

1946	DIVISIONS.														
MONTH	N.C.	H.M.	M.	S.C.	N.T.	C.T.	S.T.	N.W.S.	C.W.S.	S.W.S.	N.C.P.	C.P.	R.	W.U.	W.L.
JAN.	589	176	89	231	635	285	275	438	264	274	424	185	206	218	274
FEB.	1006	266	264	313	313	893	386	132	200	381	116	214	426	135	367
MAR.	1244	775	328	236	473	158	200	124	145	232	56	153	121	60	86
APR.	848	1244	1084	528	217	503	198	115	111	121	52	63	40	4	23
MAY	69	88	149	110	103	68	190	63	58	106	44	70	76	9	56
JUNE	28	280	461	581	53	172	328	72	83	180	33	48	131	80	108
JULY	2	11	4	22	57	131	359	37	77	362	14	45	166	5	70
AUG.	47	7	3	32	7	52	187	3	24	183	0	14	98	1	21
SEP.	260	189	76	130	336	78	88	272	101	30	319	104	14	185	26

N.B. Note very low figures in some divisions during past six months.

Prepared in the Division of Marketing and Agricultural Economics Department of Agriculture.

H. J. Hynes
Chief of Division

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Drawn: [illegible]

APPROVED VEGETABLE SEED.

Alterations in Production Procedure.

FOLLOWING discussions with representatives of the New South Wales Seedsmen's Association and Vegetable Growers' Association of New South Wales, the Department of Agriculture has decided to alter the conditions relating to the production of approved vegetable seed, which it may be desired to advertise in the ***Agricultural Gazette.***

Although the Department has always endeavoured to satisfy itself that the seed advertised in the ***Gazette*** **was of good quality, this has not always been possible, and the new procedure is designed to achieve this objective as far as practicable.**

Under the revised conditions the approval of seed will be confined to that produced from crops grown in New South Wales, which have been inspected at least once during the growing period, by an authorised officer of the Department. Application for inspection must be made on a special form at least thirty days before the inspection is required to be carried out. In considering the applications, due regard will be paid to the suitability of the locality for the kind and variety of seed to be produced, the facilities available for seed production, the convenience of inspection, the experience of the grower and the methods by which it is proposed to clean and thresh the seed.

In approving vegetable crops submitted, particular attention will be paid to trueness to type, purity, vigour and freedom from seed-borne diseases.

Each line of approved seed will be given an identification and reference number, which must be affixed to all parcels of seed sold. Samples must be submitted to the Department for testing and for reference purposes. It will be necessary for the seed to conform to the standards laid down in the Agricultural Seeds Act of New South Wales before being listed.

The scheme will be limited to the most important kinds of vegetables, and the best recommended varieties.

Advertising in the *Agricultural Gazette* will be charged for at the rate of 2s. 6d. per item per issue.

Full details of the new conditions, together with application forms, are available to seed growers on application to the Chief, Division of Plant Industry, Department of Agriculture, Box 36A, G.P.O., Sydney.

Varieties Listed for November.

Cauliflower—

Shorts—H. Burton Bradley, Sherwood Farm, Moorland.

Five Months—E. A. Sharp, 110 Gordon avenue, Hamilton.

Planting of Potatoes.

Importance of Correct Row Spacing.

MOST potato growers in the lighter rainfall districts plant the rows too close together, rows two feet to two feet four inches apart being quite common. A narrow row spacing is satisfactory in a good season, when soil moisture is not a limiting factor, but in a dry season narrow rows spell disaster. Not only do they limit the root zone and the amount of moisture available to the plant, thus decreasing yields, but efficient hilling of the crop, usually an all important operation during a dry season, is made impossible. Wide rows, say three feet apart, enable wide-based hills to be formed, which completely cover the crown of the potato rows, thus giving any shallow tubers the necessary protection.

Experience in New South Wales and other countries indicates that very deep planting has an adverse effect on yield. However, deep planting renders the tubers less liable to moth damage and sunburn by inducing deeper tuber setting. It has been found in the United States that deep planting, whilst decreasing the number of tubers, increases the percentage of larger tubers.

The depth to plant must be influenced by circumstances, a moderately deep planting (six to seven inches) being more suitable for main crop districts. With early crops, particularly those grown on the heavier soils as distinct from sands and sandy loams, shallow planting (five inches) is desirable in order to achieve quick emergence and minimise decomposition of the seed sets. The use of whole seed is recommended when planting is carried out during the summer, as it results in a better strike.—A. C. ORMAN, Special Agricultural Instructor.

A Successful Campaign.

BUNCHY TOP DISEASE OF BANANAS

Controlled by Co-operative Effort.

H. W. EASTWOOD, H.D.A., Special Fruit Instructor.

THE success of the campaign to control bunchy top disease in bananas in this State has enabled the re-establishment of the industry following its virtual destruction by the disease in the period 1923-1927, is a triumph for practical co-operation of growers and their organisation with Departmental officers, and is unique in plant disease control work in Australia.

Evidence of the value of the campaign is to be found in the fact that whereas the area had receded to 3,340 acres in 1928, following the collapse of the industry, the present State acreage of 21,663 acres is only 626 acres less than the record area of 1933-1934.

The continuous surveys made in carrying out the control campaign and the analysis of the data collected have resulted in the accumulation of an exhaustive fund of knowledge on all aspects of bunchy top disease—more complete than is available in relation to any other disease in Australia.

In this description of the campaign to date, the author describes the establishment of the industry, its destruction by the bunchy top disease, and the methods by which it has been rehabilitated.

Bunchy top disease was first reported in Australia in 1913*, being introduced in banana suckers from Fiji. The disease was brought under the notice of the Department of Agriculture in 1916, and in 1918 growers expressed anxiety concerning it, although for some years the disease did not seriously affect plantations and consequently production of an industry which was then rapidly expanding.

A Flourishing Industry Destroyed.

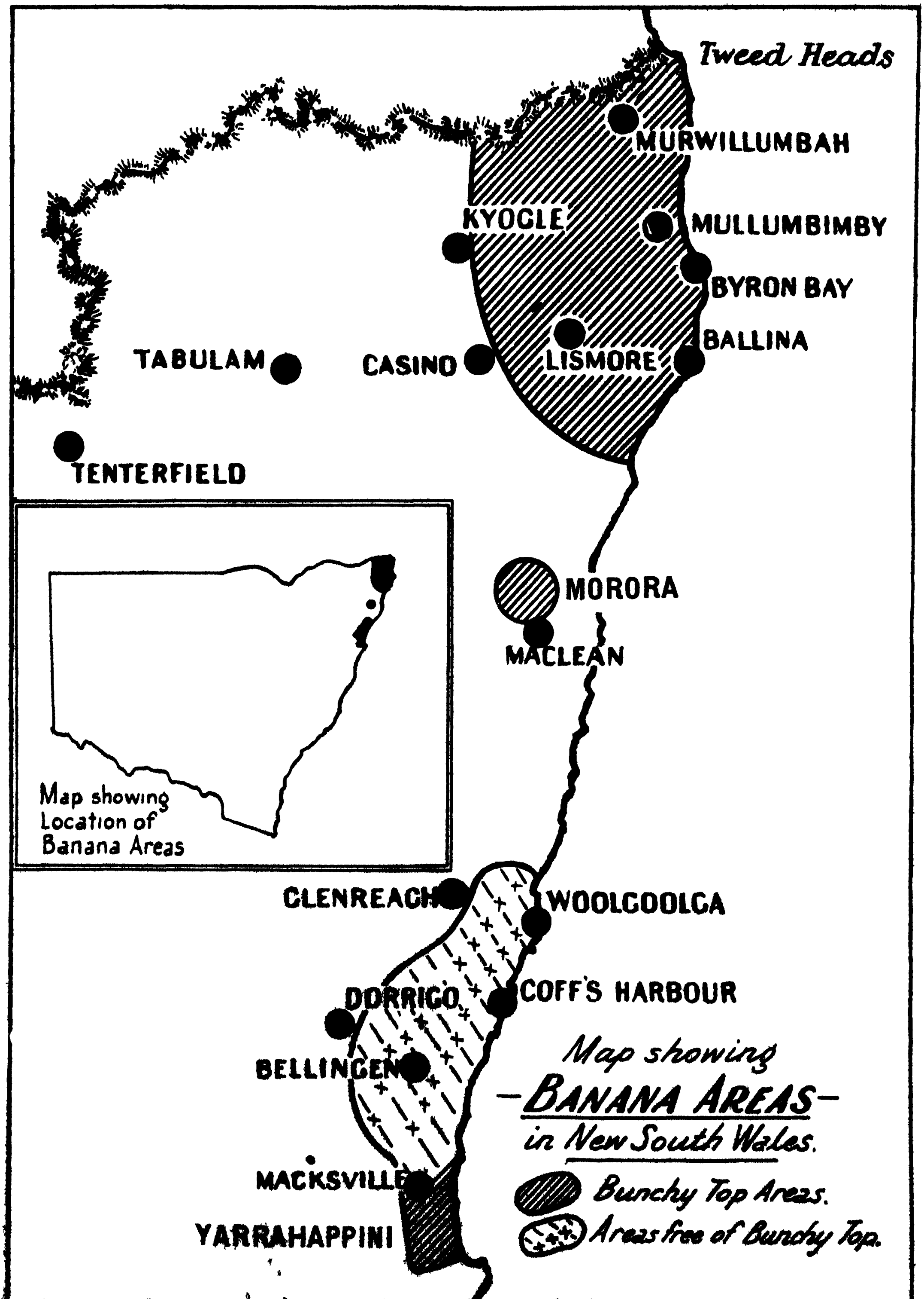
In 1916 production was only 81,000 tropical cases, but within four years it had increased to 200,000 cases and by 1922 a peak of 460,000 cases was reached.

During the next three years, primarily as a result of the epidemic development of bunchy top, disaster overtook the industry, and production steeply declined; by 1925 it had fallen to the low figure of 140,000 cases. The industry was almost extinguished in many centres in New South Wales and south-eastern Queensland by 1927.

It is doubtful if there are many other diseases on record which have wrought such devastation on a flourishing industry as that

A Healthy Banana Plant.
Photo by Russel Roberts Pty. Ltd.

* C. J. P. Magee: Investigations on the Bunchy Top Disease of the Banana. C.S. & I.R. Bulletin No. 30-1927.


Tweed Heads
MURWILLUMBAH
KYOGLE
MULLUMBIMBY
BYRON BAY
BALLINA
LISMORE
TABULAM
CASINO
TENTERFIELD
MORORA
MACLEAN
Map showing Location of Banana Areas
CLENREACH
WOOLGOOLGA
COFF'S HARBOUR
DORRIGO
BELLINGEN
MACKSVILLE
YARRAHAPPINI
Map showing
-BANANA AREAS-
in New South Wales.
Bunchy Top Areas.
Areas free of Bunchy Top.

caused by bunchy top. The disease has been easily the most serious banana malady in Australia, and has also caused serious losses in Fiji, Ceylon and Egypt.

The ruination of the plantations in most districts caused serious loss to a lucrative primary industry, a direct financial loss to individuals, districts and States, while heavily capitalised land had to be utilized for other, less profitable primary products.

Government Control Established.

In May, 1924, the Commonwealth, New South Wales and Queensland Governments appointed a committee of three scientists to investigate this disease. After two years of research this committee found that bunchy top is an insect-transmitted virus disease.

On completing these investigations the committee recommended to the Governments of the banana-growing States, the adoption of certain measures for the control of the disease. These were accepted by the New South Wales Government, and regulations were gazetted in November, 1927. From that date the industry in this State has been under Governmental control and in the meanwhile has been successfully re-established and maintained. The original regulations have been revised from time to time.

Concurrently with the gazettal of regulations all the lands in the banana growing districts were quarantined by proclamation and divided into sixteen zones. The zones were grouped into inspectorates and Government fruit inspectors were appointed to enforce the regulations.

Zonal committees of practical growers were appointed to advise the Department on all matters concerning the industry.

Industry Conditions in 1927.

At the time the industry was placed under governmental control, fully 90 per cent. of the acreage previously planted in the Tweed and Brunswick districts had gone out of production and there were at least 800 deserted plantations totalling 5,500 acres. A further ninety plantations in these districts, embracing 550 acres, were seriously affected, although profitable at the time, but these quickly succumbed to the disease. All these plantations and acreages first had to be destroyed before a commencement could be made with the restoration of the industry, and when this was achieved, planting of new areas was permitted in 1928 with known disease-free suckers.

At this date there were bearing and young plantations, lightly infected or free of disease, mainly in the Richmond River district and other isolated localities, that were allowed to remain, because compensation would have had to be met if growers had been compelled to destroy them. It would have been advantageous to subsequent control measures, if all banana plants in districts where bunchy top was present had been destroyed before attempting to revive the industry.

Bunchy Top Stool showing Typical Symptoms of the Disease.
[*Photo by R. W. Norris.*

The collapse of the industry as a result of bunchy top disease left an indelible impression on growers, business men and financial institutions alike, and only the more venturesome and those with confidence in the control measures planted bananas again in 1928. This attitude prevailed for a few years, during which time the progress of new plantings was watched with keen interest by everyone.

Good Control and High Prices Resulted in Heavy Planting.

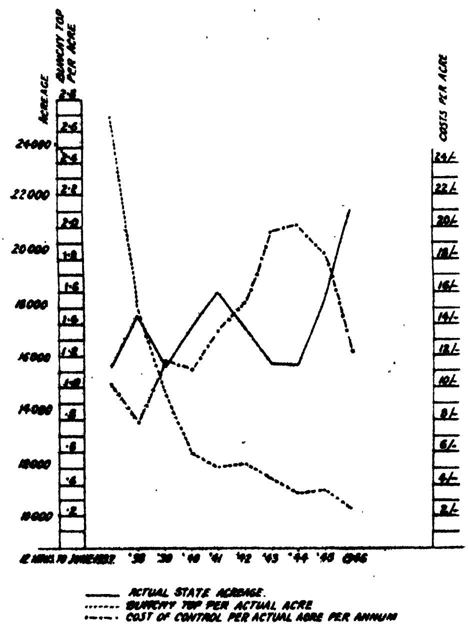
The acreage was built up by plantings of between 1,100 and 1,600 acres annually from 3,340 acres in 1928 to 7,443 acres in 1931. Prices received by growers during these four years were profitable and encouraging, and this, in conjunction with excellent control of the disease, satisfied many prospective "wait and see" growers that conditions in the industry were such that it was safe again to undertake banana growing.

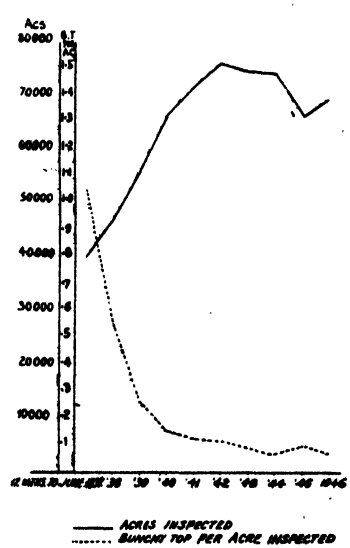
Confidence increased and growers planted heavily the next year, netting an increase of 5,403 acres and bringing the total acreage up to 12,486 acres. The plantings in 1932 were as great as the four preceding years. Prices were still good as the 5,403 acres planted in 1932 were not yet in full bearing and had not influenced market values.

At that time it became obvious that further heavy plantings during the next season would increase production in two years from planting to such an extent that markets would be over supplied and prices would then fall to low levels. Consequently repeated official warnings were issued prior to the 1933 planting season setting out the position and forecasting low incomes for growers in a couple of years if they continued planting new areas. Notwithstanding these warnings, growers planted 9,645 acres in 1933, the largest planting ever known in the State, and nearly the equivalent of the combined acreages planting during the preceding five years. The total acreage was then 22,289 acres.

Thus in a short period of six years following the adoption of control measures, the acreage of bananas had increased to four times that at any previous time in the history of the industry. This phenomenal expansion illustrated how successfully the Bunchy Top Control Campaign was functioning.

BUNCHY TOP CONTROL IN NEW SOUTH WALES YEARLY PROGRESS 1937–1946.





The control regulations and the policy of the Administration placed the onus of controlling bunchy top disease on the grower, and it was his duty to inspect his plantation regularly, find the stools in the early stages of disease, treat and destroy them in the approved manner. Departmental Banana Inspectors patrolled the plantations to advise and assist growers and see that they carried out their obligations under the regulations. Those growers who flagrantly failed to do so after being cautioned were prosecuted

and heavily penalised. Nearly all the planters were enthusiastic to control the disease, as their plantations provided them with a good livelihood, and they knew the havoc bunchy top could cause if it again got out of hand.

Overproduction Caused Negligence and Disease Increase.

Production increased yearly from 81,000 tropical cases in 1928-1929 to 1,038,765 cases in 1934-1935, when market requirements were exceeded and the plentiful supplies seriously depressed prices to a level which did not cover the cost of production and marketing. Low prices continued during 1936 and well into 1937.

Up till the end of 1934 the control measures adopted had reduced the incidence of bunchy top to a very low level, but difficulties then arose because the industry had rapidly expanded, as a result of a "boom," to a non-economic state of over production which prevailed for two years. The disease again commenced to make headway in 1935 because growers curtailed plantation labour consequent upon unprofitable returns. The position deteriorated with continuous low prices and negligent growers became so numerous that inspectors were unable to contact them often enough to see that they were attending to the disease.

Some growers became disheartened, others abandoned their holdings and in a few localities bunchy top spread quickly, threatening nearby plantations.

It can now be seen that the chief weaknesses in the Departmental control scheme operating at that time were—

(1) The area under bananas had increased out of all proportion to the acreage that inspectors enforcing the regulations could handle, thereby curtailing frequent inspections of plantations.

(2) Delays occurred in dealing suitably with negligent growers, because the process of instituting legal action was (and still is) too slow; and ownership of neglected plantations was in question and growers concerned became defiant of the regulations because the industry had become uneconomic.

(3) Penalising growers who were adamant or apathetic achieved no good purpose.

Every Stool in this Plantation is Affected with Bunchy Top.

[Photo by Dr. C. J. P. Magee.

There was an appreciable increase of bunchy top in the spring of 1935, more particularly in the Lower Tweed district, and alert growers maintained that the existing Departmental control methods of endeavouring by prosecution and penalties to make refractory growers carry out the regulations, were unsatisfactory, in so far that this procedure did not make offenders find, treat and destroy diseased stools—which is the only way bunchy top can be controlled. Prosecutions helped to hasten disappointed growers desert their plantations and these neglected, diseased plantations were a menace to neighbouring growers.

Inspection and Treatment by the Banana Growers' Federation.

The disease situation at that time prompted growers to advocate that the control measures be supplemented to ensure that plantations were regularly and conscientiously inspected, all diseased stools found, properly treated and destroyed to arrest the spread of the disease. The assistance suggested was that the growers' organization, namely, the Banana Growers' Federation, should employ men to find and spray with power kerosene all diseased plants in the worst infected plantations, in areas that were unoccupied, in plantations where the occupiers were unable to do the work and in areas belonging to negligent growers.

This supplementary scheme was subsequently approved by the Directorate of the Banana Growers' Federation, and commenced in the Lower Tweed district in December, 1935, where bunchy top was prevalent. At first, only plantations of the type described were inspected, but gradually similar assistance was rendered to other districts with lower incidences of disease and finally the scheme embraced all districts where bunchy top was known to exist. Thus from a small beginning this self-help scheme extended and became a general scheme of assistance to growers in all districts subject to the disease.

Placing the onus on growers personally to inspect their plantations and control bunchy top revealed certain defects under adverse conditions; some growers could not tell bunchy top at all, others could only find it in the advanced stages, others disliked inspecting their plantations, available labour was ineffective at this work and some growers did not believe in the regulations.

The supplementary system not only overcame these faults, but provided competent detectors—expert in finding and treating bunchy top plants—and assured growers that all plantations were regularly inspected in districts where disease was present.

An Effective and Economic Scheme.

The system is effective, economically sound, relieves owners of plantations of anxiety and worry, is cheaper and more acceptable to growers than the original control plan, but under the Plant Diseases Act the onus of finding and treating bunchy top still rests with the grower. In actual practice few growers inspect their plantations independently, but rather depend upon the scheme to control bunchy top for them.

The splendid contribution of the Banana Growers' Federation in the supply of detectors, equipment and materials has been incorporated into the Departmental scheme, and the genuine co-operation existing between this society and the Department is

DETAILS OF THE NEW SOUTH WALES BUNCHY TOP CONTROL CAMPAIGN—1937-1946.

Financial year ended.	Actual acreage.	Acreage inspected.	Bunchy Top found.	Average Bunchy Top per acre.		Progressive acreage inspected.	Progressive Bunchy Top.	Total costs.	Progressive costs.	Average cost per acre.	
				Actual.	Inspected.					Actual.	Inspected.
								£ s. d.	£ s. d.	s. d.	s. d.
1937	15,743	39,711	42,305	2·69	1·06	39,711	42,305	5,539 0 0	5,539 0 0	10 2·86	2 9·84
1938	17,736	47,207	26,755	1·51	0·57	86,917	69,060	5,134 0 0	10,673 0 0	7 10·64	2 2·10
1939	15,808	56,300	15,114	0·96	0·27	143,217	84,174	6,897 2 4	17,570 2 4	11 9·53	2 5·19
1940	17,211	66,413	10,488	0·61	0·16	209,630	94,662	7,190 2 6	24,760 4 10	11 2·87	2 1·98
1941	18,598	71,957	9,585	0·52	0·13	281,587	104,247	8,740 9 8	33,500 14 6	12 6·74	2 5·15
1942	17,236	76,010	9,146	0·53	0·12	357,597	113,393	9,798 19 2	43,299 13 8	15 3·77	2 6·94
1943	15,946	74,615	6,836	0·43	0·09	432,212	120,229	11,532 3 6	54,831 17 2	19 9·70	3 1·09
1944	15,933	74,187	5,327	0·33	0·07	506,399	125,556	11,845 0 7	66,676 17 9	20 2·40	3 2·32
1945	18,239	65,953	6,625	0·36	0·10	571,352	132,181	12,476 0 2	79,152 17 11	18 2·74	3 9·40
1946	21,663	68,936	5,144	0·24	0·07	640,288	137,325	13,328 13 7	92,481 11 6	12 3·67	3 10·40

reflected in the smooth working of the campaign.

It is not the aim of the scheme to eradicate the disease in the Tweed, Brunswick and Richmond River districts (although this has been attempted in the extreme southern areas), but it is claimed that the disease has been satisfactorily controlled. The accompanying table and graphs show the progress that has been made in reducing bunchy top and illustrate the excellent results obtained since 1936.

The sharp rise in expenditure for all districts from 1940 to 1944 is attributed to increases in wages, an intensified campaign in certain localities during the summer period and a decrease in State acreage.

It is realised that there is still scope for improvement of the Scheme, and possibly the most desirable amendment would be the inclusion of the destruction of the diseased stools for the grower in addition to more frequent inspections. This was about to be adopted when war broke out, but in view of the uncertain labour position, it had to be left until a more opportune time.

(*To be continued.*)

Aeroplane Spraying of Locusts.

Report on the Gunnedah Trial.

"THE reports of my officers on the recent experiments in aeroplane spraying of Australian plague locust hoppers at Wean, near Gunnedah, show that the hoppers can be killed by this method, and that wheat crops extensively infested with hoppers can be quickly treated," announced Hon. E. H. Graham, M.L.A. (Minister for Agriculture). "However, the amount of ground work necessary in marking swarms by means of smoke signals and the difficulty of accurately depositing the spray on isolated swarms without using excessive quantities of material suggest that considerably less effort would be involved in the distribution of poison bran bait as at present adopted.

"There was some evidence that surging of the spray and wind-drift can cause uneven distribution of spray liquid on the ground. It would appear that slow flying aircraft, particularly helicopters, are logical developments in the aerial distribution of insecticides."

The experiment was conducted in co-operation with the Victorian Department of Agriculture and the R.A.A.F.

The area treated was an extensive cultivated flat with but few trees standing in the paddock, and was, therefore, much more suitable for the operations than the conditions occurring in the general run of grasshopper areas. The crops sprayed had a relatively uniform population of the Australian plague locust in the "hopper" stages, which approached swarm density in three locations.

The aeroplane used was a modified Beaufort bomber from which the spray was discharged from a boom consisting of three perforated bars. The 'plane travelled at 150 miles per hour at an altitude of from 30 to 80 feet, according to the experiment.

The materials used were a 4 per cent. benzene hexachloride ("666" or Gammexane) in a diesel fuel oil, and a 2.7 per cent. di-nitro-ortho-cresol (D.N.C.) in a similar type of oil.

In the benzene hexachloride tests the effect of the spray on the hoppers was noticeable within an hour, and some mortality was evident in three hours. Examination after twenty-four hours revealed a marked reduction in the number of living hoppers, and an appreciable number of dead hoppers could be easily seen. Hoppers were still dying five days after treatment, thus indicating a useful residual effect. The "hoppers" treated were in adjoining crops of wheat, oats and barley which had made little growth, and some spray injury was noticeable. However, at the end of five days the wheat and barley had recovered and were growing well in spite of the injury first noticed.

In the di-nitro-ortho-cresol experiments the "hoppers" reacted immediately and mortality commenced within an hour. In a narrow band 20 yards wide a very high mortality occurred, but outside this the mortality was much less. This was apparently due to the surging of the spray causing it to settle irregularly. The stunted wheat crop in which these hoppers were treated showed severe spray injury within three days.

THE cow is a very nervous animal, and harsh treatment easily upsets her. Often the better the breeding and the greater the production, the more highly strung she is. Beating, scolding, and use of dogs should not be permitted in a milking yard. Not only will the quantity of milk given decrease considerably from such practices, but the fat content will likewise diminish. It has been noted frequently that a test has dropped 1 to 1.5 per cent., and the milk weight 30 to 50 per cent.

Walnut Growing.

J. A. BALLANTYNE, Special Fruit Instructor.

WALNUT production is more likely to prove profitable in inland areas where the summer temperatures are not too severe, and with irrigation water making up for any deficiency in the rainfall, and for the successful growing of this nut it is essential that the trees be planted under most favourable soil conditions.

Climatic Considerations.

The chief climatic limitations to successful walnut culture are frosts and extreme heat. Spring frosts may destroy the flowers or small nuts, so that a position considered suitable for the production of other deciduous trees should be utilised. The planting of trees in low-lying areas, on account of soil depth, may be ruinous from the point of view of temperature.

Extreme heat during the summer may cause sunburning of the nuts to such an extent that the crop may be materially reduced. If sunburning takes place when the nuts are very immature, the kernel may fail to develop. At a later stage in nut maturity, although the kernel may be saved, the quality in addition to the weight, will be reduced. A temperature exceeding 100 deg. Fahr. may prove harmful to nut production.

Generally it could be said that an average of 30 inches of rain is required for successful nut production, but no hard and fast rule can be laid down, as soil type, climate, age, spacing of trees, etc., are all influences which must be reckoned with. The walnut tree is large, carries a big leaf surface, and consequently requires an abundance of soil moisture through the growing period.

Soil Requirements.

To produce large, long-lived trees capable of maximum production, the soil must be of good depth, loamy and rich in organic matter. Shallow soils, unless overlying a very friable clay subsoil, are unsuitable, as also are sandy soils of a deep character. It is impossible to judge the suitability of a soil from a cursory surface inspection; the subsoil is of more importance than the top soil in the matter of its suitability for walnut production. The walnut tree is deep rooted and deep penetration of irrigation water is difficult on heavy soils and/or subsoils.

Good drainage to a depth of in the vicinity of 10 feet is considered a requirement for best walnut production. These trees are readily injured if there is much alkali present, so that in addition to the necessity for good drainage, the quality of the irrigation water is also important.

Varieties.

The majority of walnut trees growing in New South Wales are seedlings and, of course, there is considerable variation in the quantity and quality of nuts produced from these trees. The fruit from the seedling tree is seldom identical with the parent, and in fact is generally inferior to the parent. The planting of trees of specified varieties which have been produced by budding or grafting, on seedling stocks, is imperative if the trees are being planted for commercial nut production. Unfortunately, we have little experience of walnut varieties in New South Wales, and the grower planting these trees must be prepared for the possible comparative failure of some varieties when planted under different conditions of climate and soil.

One of the drawbacks to walnut growing is Walnut Blight, which is by far the most destructive disease affecting walnut trees. Some varieties are more susceptible than others, so that, all things considered, and especially if the trees are being planted in the higher rainfall districts, varieties least susceptible to blight should be selected.

The following varieties are suggested:—Franquette, Concord, Payne, Eureka, Placentia, Freshford Gem.

Propagation of Trees.

Experiments have been carried out in this State in methods of propagation, and the results of both budding and grafting have been very irregular and unsatisfactory. Work carried out at East Malling Research Station, Kent, England, has shown that the variable climatic and other conditions were such that the propagation of walnut trees in the open was not recommended, and a method of raising these trees under glass has been evolved.

In Australia few nurserymen can claim commercial success in working walnut trees; the percentage of "takes" is small and consequently the price of trees to the grower is high. Purchase of trees from nurserymen is suggested rather than an attempt to grow and produce trees; the cost may be high, but is balanced against the loss of time and probable failure in the end to produce trees.

In America the California Black walnut is used as root stocks; in Australia it has still to be proved whether this stock has any advantages over rootstocks produced from nuts from vigorous seedling trees.

The growing of the walnut stocks presents no problems, the nuts germinate freely. For success in the "working" of these trees to desired varieties, the first essential is that a strong, quick-growing seedling tree must be produced. The seeds should be planted in well prepared, fertile soil of good depth. They should not be allowed to suffer from lack of moisture and must be kept growing vigorously. The stocks should have attained a diameter of at least one inch before grafting or budding is carried out.

Scion or budding wood should be collected from healthy, vigorous trees. It may be found necessary to prepare parent trees from which it is intended to collect material, by hard cutting the previous year in order to produce healthy, strong, scion wood.

Grafting should be carried out when the stock has commenced to move, and when temperatures are in the vicinity of 75 to 80 deg. Fahr. Grafting during cold weather will almost certainly end in failure. The type of graft used matters less than condition of stock, scion and temperature. Either the bark or wedge graft is satisfactory. Grafting below ground level is advised, also speed in the operation. The scion should be tied and both stock and scion mounded over with moist soil.

Budding is considered the most satisfactory method of propagating walnut trees. The patch bud is recommended, and the conditions necessary to success in grafting apply. The bud should be put in place in late summer, tied and waxed.

Planting.

The distance apart the trees should be planted will depend mainly on soil and climatic conditions. Under ideal conditions probably 50 feet between trees will not be too great. In America the highest producing trees are planted 60 feet apart. Under less suitable conditions probably 40

feet between trees will be satisfactory. The number of trees per acre would be:—

40 feet x 40 feet—27 trees.
50 feet x 50 feet—17 trees.
60 feet x 60 feet—12 trees.

With any of the above spacings, and particularly with the wider plantings, only a small portion of the orchard land is being utilised for several years of tree growth. Under these circumstances, it would be profitable to use filler trees or inter-crops of some description.

When lifting is being carried out, care is necessary to ensure that the long taproot is not unduly injured, and when planting a fair sized hole will have to be dug. Watering the newly planted tree before the hole has been completely filled in is advised.

Some varieties of walnut are self-fertile. The staminate flowers are produced in long catkins which contain an abundance of pollen which is mostly wind-borne to the pistillate flowers. Heavier crops are usually carried where two or more compatible varieties are planted in close proximity.

Pruning.

Following planting, the trees should be headed to a height of about 5 feet or 6 feet from the ground. If the trees are not high enough for heading, they should be left untopped for a year or until they are sufficiently high, when the top can be cut or pinched off at the required height. From this stage onwards, pruning is light and consists mainly of removal of shoots from the lower portion of the tree, and shortening any leaders which may be outstripping the others or limbs which are over-crowded or crossing.

Until such times as the walnut tree has made sufficient top growth, the long stem is exposed to the sun and extremes in temperature. It is advisable, for the first two or three years, to protect the trunk, particularly from sunscald. This can be done by the use of a loose wrapping of hessian, tree guards or by white-washing several times through the summer months.

Cultivation.

No hard-and-fast rule can be laid down in the matter of cultural operations to be followed. Sound cultural practice in one district or one season may be quite poor practice in another district or different season. The continuous stirring of the soil is detrimental, but some cultural treatment must be carried out to prevent the loss of soil moisture mainly brought about by excessive grass or weed growth.

Walnut trees require plenty of water and deep penetration. This would suggest two practices, firstly a deep late winter ploughing to increase penetration of water; and secondly, some control of the green matter between the trees during the summer months to reduce loss of soil moisture during the period of the year when the trees require it most.

Generally it can be said that the walnut tree requires the same amount of attention in this regard as do other fruit trees.

Harvesting.

When the walnuts have reached maturity, the hulls split open to release the nuts, which are allowed to fall on the ground. The fall of nuts can be hastened by the use of poles with hooks on the ends for use when shaking the limbs prior to picking up. The nuts should not be allowed to remain on the ground for a lengthy period during showery weather, otherwise loss of colour, and in some cases mouldy kernels, may result.

Some of the nuts when picked up will not be entirely free of adhering hull, and there will be a percentage of "sticktights" from which some difficulty may be experienced in removing the hull. These "sticktight" nuts should be separated from the main sample, as there is generally a high percentage of inferior nuts amongst them—blanks, mouldy and discoloured kernels.

After hulling, if the nuts are dirty, it will be necessary to wash them, then dry thoroughly and as quickly as possible. Drying can be carried out in a dehydrator or the nuts placed in shallow slatted trays and dried in the sun on low racks to allow ventilation. The nuts on these trays should be stirred frequently and covered during wet or very hot weather. Any extremes in temperature should be avoided, otherwise splitting of the nuts will take place. Slow drying prolongs the process, but prevents splitting. When the nuts are nearly dry, they should be stacked for final drying.

(*Continued on page 584.*)

PLANT DISEASES

Notes contributed by the Biological Branch

Diseases of Antirrhinums and Zinnias.

Antirrhinum (Snapdragon) Diseases.

ALTHOUGH antirrhinums are hardy and strong-growing annuals usually fairly free of disease, a number of parasitic fungi can attack them and cause loss unless protective measures are adopted. The commonest diseases met with are : anthracnose, causing spots on leaves and stems; downy mildew, which is chiefly a disease of seedlings; wilt, which can be caused by several different organisms; and the virus disease "greening." Rust, which is the most destructive of all diseases attacking antirrhinums is not present in this country.

Anthracnose.

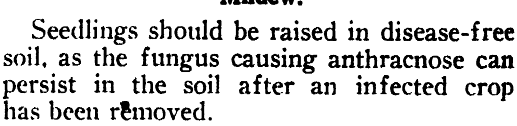
This disease is caused by a parasitic fungus *Colletotrichum antirrhini*. It attacks leaves and stems, forming sunken spots which are oval or circular, and at first yellowish green to dull white, with a narrow brown border. Later, small black spots, which are the fruiting bodies of the fungus, are formed on the affected areas.

The disease is favoured by moist, warm conditions, and spreads rapidly following rain. Plants are subject to attack at any time from the seedling stage to maturity.

Downy Mildew.

This disease is caused by a parasitic fungus *Peronospora antirrhini*. It can cause the complete failure of seedlings, and is most destructive when the plants are raised under crowded conditions. Humid weather favours the development and spread of downy mildew. It is of less importance once the seedlings have been planted out.

Affected plants are dwarfed and the leaf tips and margins are curled downwards. On the undersurface of affected leaves the parasite produces a growth of fungous threads and masses of spores which give them a mealy-white or whitish-violet appearance in contrast to the smooth surface of a healthy leaf.



Anthracnose on Snapdragon Stem.

Control Measures for Anthracnose and Downy Mildew.

Seedlings should be raised in disease-free soil, as the fungus causing anthracnose can persist in the soil after an infected crop has been removed.

From the time they are an inch high, the seedlings should be sprayed with Bordeaux Mixture 4-4-50, to which white oil at the rate of 1 to 2 fluid oz. per gallon is added as a sticker and spreader. It is important to commence spraying before anthracnose

or downy mildew become established, since once the plants become infected it is difficult to prevent the extension of the diseases. It is necessary to get a good coverage with the spray on lower leaf surfaces as well as upper. For this reason it is best to plant the seed in drills several inches apart, so that the spray can be directed horizontally at the plants and thus reach the leaf undersurfaces. A very fine nozzle should be used.

The seedlings should be sprayed at intervals of seven days for control of downy mildew.

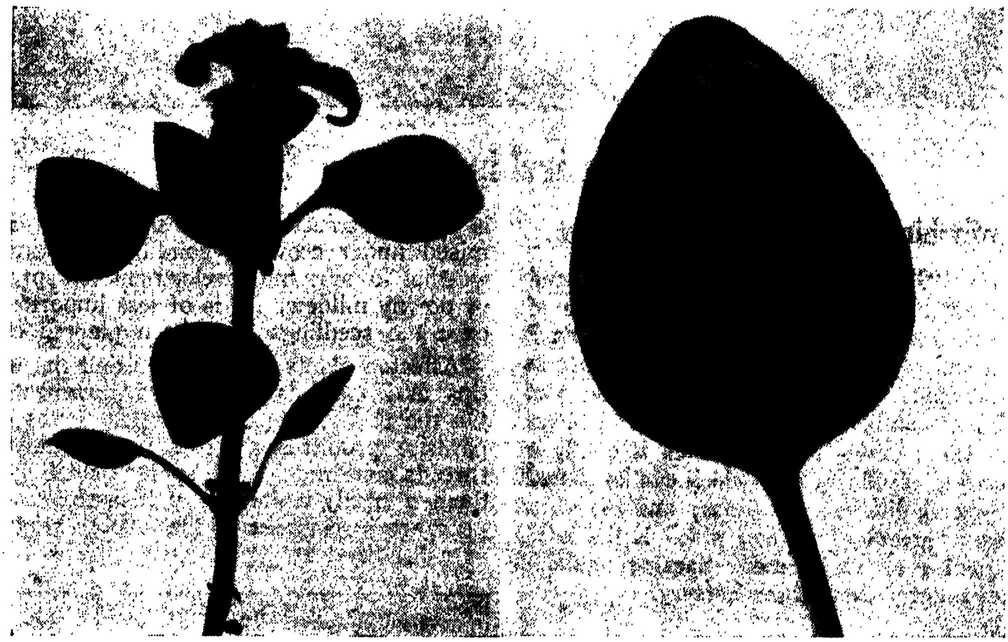
Most important of the parasites are:—

Phytophthora cryptogea, causing crown and root rot;

Verticillium dahliae, causing wilt;

Rhizoctonia solani and *Sclerotium rolfsii*, causing collar rots.

The root rot fungus is favoured by wet soil conditions and cool to moderate temperatures. When a plant becomes infected, the root system rots away, the attack often commencing on the main root just below ground level. Other ornamentals such as asters, primulas, cinerarias, ipomopsis and marigolds are also attacked by this fungus.



Downy Mildew of Antirrhinum.

Left.—An affected plant, showing curling of the leaves. *Right.*—Affected leaf, showing fungous growth on under-surface.

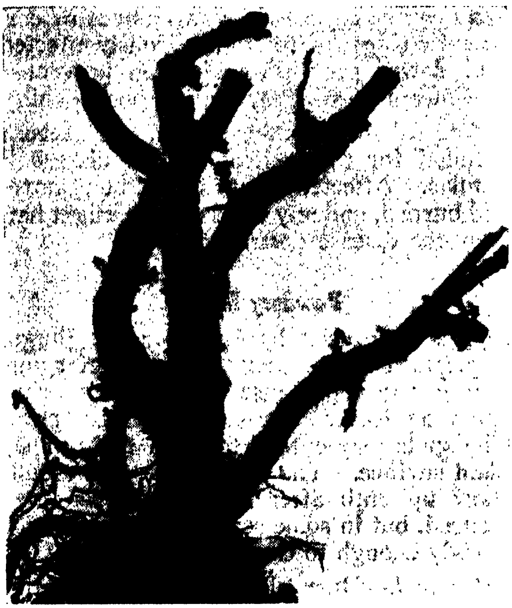
After planting out, mildew is unlikely to be a problem, but spray applications at intervals of ten to fourteen days during damp or humid weather should be made to keep anthracnose in check. If the weather is dry and no infection is observed, spraying can be discontinued. An application should be made, however, following a period of rain.

Wilt Diseases.

Antirrhinums are rather subject to attack by a number of soil-inhabiting parasites, and the symptom is much the same in each case, *i.e.*, the plant wilts and finally dies.

The wilt disease is usually most serious in cool weather. Affected plants at first may wilt only during the daytime, recovering overnight. The roots are not rotted, but the woody part of the stem and roots is discoloured, becoming a dark brown due to the presence of the parasite. Tomatoes and potatoes are very subject to attack by this disease.

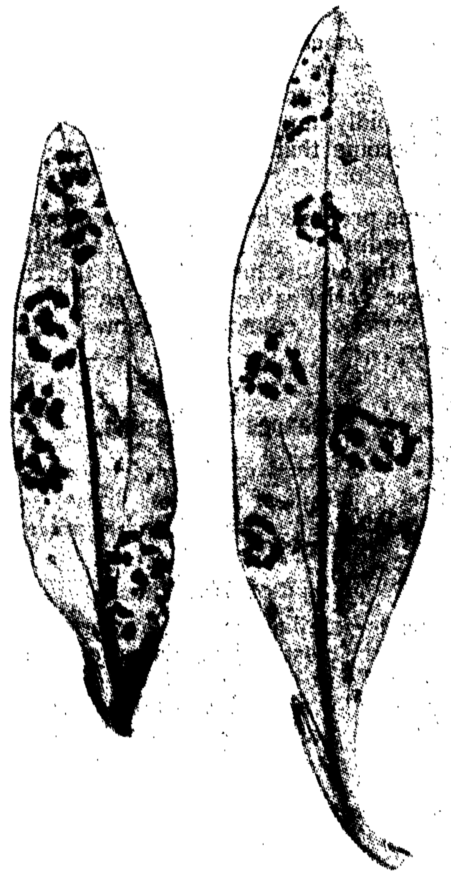
Rhizoctonia collar rot is favoured by warm, moist conditions. The stem at ground level is attacked and rotted. This disease attacks a wide range of flower and



Sclerotium Collar Rot of Antirrhinum.
Basal part of a dead plant, showing weft of white fungous threads and small, brown resting bodies of *Sclerotium rolfsii.*

Rust Pustules on Snapdragon Stem.
[*After Peltier.*

vegetable crops. Carnations, delphiniums and asters are particularly susceptible, and beans, potatoes, cabbages, zinnias and stocks and many other plants are susceptible to this disease. Sclerotium collar rot is serious only during the hottest months. The stem at ground level is attacked and rotted, and the fungus produces small resting bodies about the size and colour of cabbage seeds over the infected surface.



Rust Pustules on Lower Surface of Snapdragon Leaf.
[*After Peltier.*

Control Measures.—A crop rotation should be adopted—susceptible crops should not be grown in infected soil more often than once in four years. Watering should be adequate but not excessive, and drainage should be good. Infected plants should not be ploughed in, or added to the compost heap, but should be removed and burned. The liberal use of animal manure is of benefit.

Rust.

Australia is one of the few countries where this disease is not present, and consequently the full range of susceptible varieties can be grown. Plants are liable to attack at all stages of growth, and the effect is especially severe just before blooming. Leaves, branches, and occasionally the seed pods, are subject to infection. The first sign of rust development is the appearance of light-coloured, raised spots, and within a few days these break open, exposing dusty brown masses of spores. A characteristic is the arrangement of these spots in circles round one or more central spots. Under favourable conditions, the fungus spreads very rapidly, and so serious may the infection become that the plant may be killed either before or at the time of flowering.

Some progress has been made overseas in the breeding of rust resistant varieties, but so far the quality and colour of the flowers of these varieties do not approach those of the varieties commonly grown in this country.

Diseases of Zinnias.

THESE hardy and quick-growing annuals are subject to attack of the virus disease spotted wilt, to root and collar rots and to mildew.

Spotted Wilt Virus.

This is familiar to all growers as the cause of the most serious disease of tomatoes in New South Wales. It attacks a wide range of flower and vegetable crops, and is carried from infected to healthy plants by means of thrips. In zinnias, the symptoms show first on the youngest leaves, which become mottled with a mosaic of light greenish-yellow and purple, and are often twisted and misshapen. The mosaic often takes the form of a pattern of wavy lines or concenteric rings. Growth is seriously affected, and flower production is often prevented. If flowers form, they are of poor quality.

Control.—No method can be recommended for the control of this disease in zinnias. Affected plants should be removed and burned, and any weeds which might harbour the disease destroyed.

Powdery Mildew.

This is caused by the parasitic fungus *Erysiphe cichoracearum*. The chief symptom is the appearance of powdery white spots on leaves, stems and flower parts. The spots may extend to cover most of the plant surface. The disease does not usually show up until after blossoming has commenced, but in some seasons it may develop quickly enough to cause loss.

Control.—Dust plants with fine dusting sulphur or a mixture of equal parts of sulphur and hydrated lime, at intervals of ten to fourteen days, commencing about flowering time.

Root and Collar Rot.

Chief cause of this disease is the soil inhabiting fungus *Rhizoctonia solani*. Plants are attacked at soil level, and the tissues are rotted away. This results in the wilting and death of the above-ground parts.

Control.—Seedlings should be raised in disease-free soil, or in soil which has been sterilized by treatment with formalin (see Plant Disease Leaflet No. 103, obtainable from the Department). Crops should not be grown in infested soil more frequently than once in four years.

The liberal use of animal manure will assist in checking losses from this disease.

Walnut Growing—*continued from page 580.*

Bleaching is recommended for the preparation of a first-class product. The following bleaching solution should be satisfactory: chloride of lime 25 lb., sal soda 18 lb., dissolved in 50 gallons of water, sulphuric acid being added to the clear liquid (which has been drawn from the settlings) at the rate of 1¼ lb. to 425 lb. of solution. The walnuts should be immersed in this solution for from 5 to 10 seconds.

Unsprayed apples or pears are an open invitation to every Codling Moth to make a Dove Cote out of your orchard.

Keep these "bad tenants" away by using Gargoyle WHITE Spraying Oil and Arsenate of Lead regularly —the Oil destroys the eggs while the Lead will kill the grubs that escape the oil. You'll have to spray from petal fall to picking.

VACUUM QUALITY PRODUCT

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VACUUM OIL COMPANY PTY. LTD. (Incorp. in Aust.)

INSECT PESTS.

Notes contributed by the Entomological branch

The Vegetable Weevil

(Listroderes obliquus).

THE adults of this weevil have been abundant during the past few months and reports of damage to crops have been received. The adults become most numerous during October and November and at this period may cause severe injury. Where heavy infestation occurs, even the stalks of the plants may be destroyed, and root crops such as beetroot, carrots, parsnips, turnips, etc., may be eaten into below ground level and destroyed.

The adults hide in the soil about the bases of the plants during the day and feed at night. In addition to attacking vegetables, they also feed upon a wide variety of weeds. They will continue to feed on the plants until about the end of November and will then make their way down into the soil where they will remain inactive during the summer. During the cooler autumn weather they will emerge again and commence to lay their eggs, either on the soil at the bases of the plants or on the crowns of the plants. The legless larvae are found during the cooler months of the year.

This weevil, which measures about ¼-inch in length, is grey-brown in colour, and has its head produced forward into a snout, at the extremity of which are the jaws.

Control.

Clean cultivation is an important factor in the control of this pest. All weeds should be destroyed early in the winter to prevent the larvae developing. The removal of weeds late in the season, may cause a migration of these or other pests into cultivated areas. As an additional precaution, before planting out, any ground that has been cleared should be baited after an interval of several days, either with poisoned foliage bait, or a poisoned bran mash.

With most crops such as carrots, potatoes, etc., *the foliage of which is not used as food,* lead arsenate may be applied, either as a spray or dust, to control the pest.

The Spray:—

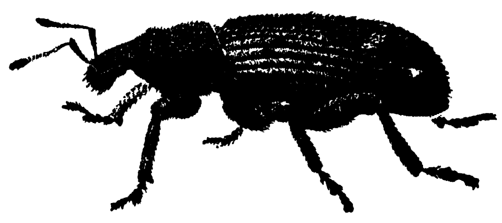
Lead arsenate powder ..	4 oz.
Water	5 gals.

The Dust:—

Lead arsenate powder ..	1 lb.
Kaolin or talc	4 lb.

Where the weevils are infesting crops such as lettuce, etc., *the leaves of which must not be contaminated with lead arsenate,* the poisoned foliage bait or poisoned bran mash must be used.

The poisoned foliage bait is made from chopped leaves of waste lettuce, turnips, marsh mallows, Cape weed, etc., which have been either sprayed or dusted with lead arsenate, and is scattered over the ground or along the rows of plants late in the afternoon.



Adult of the Vegetable Weevil.

Bran may not be readily obtainable, but the recommended formula for this bait is as follows:—

Bran	24 lb.
Paris green	1 lb.
Salt	8 oz.
Water	2½ gals.

To prepare the bait the bran and Paris green should be thoroughly mixed first, and then made into a damp, crumbly mash with the water in which the salt has been dissolved.

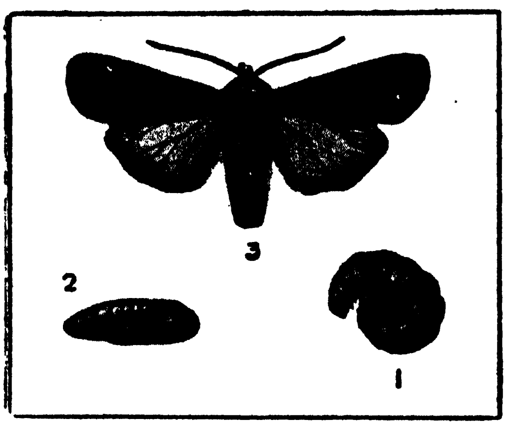
This bait is broadcast over the area before planting out (at the rate of 50 lb. to the acre), or in later infestations spread along the rows of infested plants. This bait is best distributed late in the afternoon, so as to remain fresh overnight. This poison bait should be kept out of the way of stock.

Dusts and sprays containing D.D.T. have been used in limited tests for the control of this weevil, and have shown promise of being effective.

Cutworms *(Noctuidae)*.

CUTWORMS, which occurred during the past two months in various districts, are now appearing as adult moths. These moths, which measure about 1½ inches across their outspread wings, are mostly greyish-brown or reddish-brown, black or buff-coloured. They usually hide in sheltered positions by day and commence to fly about at dusk. They are frequently attracted to lights at night.

The popular name of "cutworm" has been applied to the caterpillars or larvae of these moths, on account of the manner in which many eat through the stems of the plants at ground level and cause them to fall over and die.



1. Cutworm or Larva in Characteristic Curled Attitude.
2. Pupa or Chrysalis. 3. Adult or Cutworm Moth.

These larvae vary in size but mostly, when fully-fed, measure about 1½ inches in length. They are usually stout, soft-bodied caterpillars, which vary from almost black or slaty-brown to various tints of green or yellow, and often bear lighter, longitudinal stripes or other markings on their bodies. Many of the species, when disturbed, curl up into a spiral. They are mostly night-feeders and shelter in the soil about the bases of the plants or under clods during the day. Some, such as those known as "army worms," may feed during the day and at times move in vast numbers over cultivation paddocks, stripping most plants bare of foliage.

When fully-fed the cutworms usually make their way down into the soil for several inches, and there they enter their pupal or chrysalis stage within earthen cells.

Cutworms feed upon a wide range of plants and may cause extensive damage to young plants soon after they appear above ground, or to newly planted out crops, such as cabbages, cauliflowers, tomatoes, etc.

The life-histories of cutworms vary according to the species and the locality inhabited, and there may be several generations in any one season. Under warm conditions, the life-cycle from egg to adult may be completed in about six weeks. The winter months are usually passed in the resting, pupal stage.

Control.

As cutworms feed upon a wide variety of weeds in addition to cultivated crops, they may be already present in the soil when the area is being prepared for cropping. Therefore, where ground has been cleared, a poison bait should be distributed over the area after an interval of one or two days as a precautionary measure, before planting out.

The recommended poison bait is the bran-Paris green mixture, prepared according to the formula given for control of the vegetable weevil, but as bran may not be available, the alternative bait of poisoned chopped foliage is suggested for their control.

Where army worms are attacking crops, a deep furrow cut in front of the advancing caterpillars with the vertical side nearest the crop, temporarily checks their progress.

Holes may be dug at intervals along the furrow, and the caterpillars that fall into them destroyed. A log drawn along the furrow will crush large numbers of the caterpillars, or they may be killed in the furrow by spraying with an oil emulsion.

The Tomato Caterpillar *(Heliothis armigera)*.

THIS caterpillar is one of the most important pests of tomatoes, and in areas where it occurs regularly each year, routine treatment for its control should begin when the first blossoms commence to set, and from then on, for a period of six or eight weeks there should be no cessation in the operations.

The caterpillars have a very wide range of food-plants, and although they may attack foliage, they are essentially fruit and blossom feeders. In addition to tomatoes they feed upon the tassels and forming grain of maize, the pods of lucerne and peas, the young fruit of peaches and plums, and amongst ornamental garden plants, the blossoms and seeds of daisies, hibiscus, etc.

The moth, which has a wing expanse of about 1½ inches, varies considerably in colour, but usually is buff or reddish-brown with indistinct darker markings on the fore wings and a dark brown or black area on the outer margins of the hindwings, which are yellowish in colour. They usually hide by day and commence flying about dusk, when they may be seen flitting from plant to plant to deposit their eggs.

The small, round, somewhat flattened eggs, which are laid singly, are pale yellowish, and on tomatoes are deposited on or near the blossoms. They hatch in four or five days during warm weather, but under cool conditions may take up to twelve days.

When feeding on tomatoes, the young caterpillar may make an entry into the fruit while the fruit is very small, frequently while the blossom is still adhering. It may also attack portions of the blossoms and prevent the setting of fruit, or it may feed upon the tender parts of the foliage.

Where the fruit is attacked, it may be completely destroyed. It may continue to grow, however, with the caterpillar developing inside so that by the time the fruit reaches maturity, the caterpillar within is about fully-fed, and may then eat its way out and attack and ruin other sound fruit on the plant.

The fully-fed caterpillars, which measure about 1¼ inches in length, vary greatly in colouration. Some are pale yellow to dark green with black or brown markings, others are buff-coloured with brown stripes. They attain their full development in about fourteen to twenty-one days in warm weather, but require up to six weeks under cool conditions. When fully-fed, the caterpillars make their way down into the soil for several inches, and there they enter their pupal or chrysalis stage.

The pupa, which measures about ¾-inch in length, is shiny and reddish-brown in colour. The pupal stage may be as short as fourteen days during warm weather, but under cold conditions may occupy four to five months.

Control.

Control of this pest may be obtained with lead arsenate sprays and dusts. Treatment should begin when the first blossoms commence to set fruit.

For the early North Coast areas a spray consisting of lead arsenate powder 3 lb. to 40 gallons of water, should be applied at weekly intervals. Mid-way between these applications the crop should be dusted with

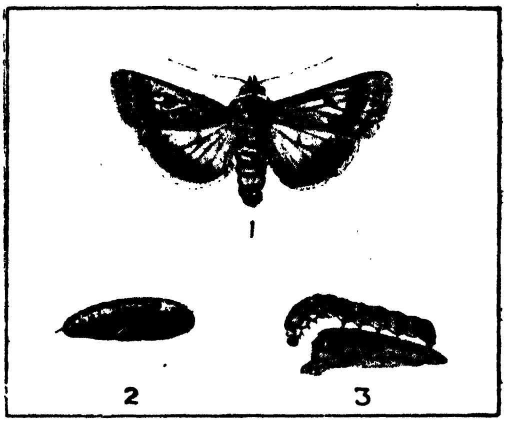
The Tomato Caterpillar Attacking a Well-developed Tomato.
[After Quaintance and Brues.

a mixture consisting of equal parts by weight of lead arsenate powder and kaolin (50 per cent. mixture).

When spraying the whole plant should be covered, but when the applications of dust are made, only the tops of the plants, the

blossom hands and young fruits need to be treated. When the plants become too high for dusting, a spray consisting of lead arsenate powder 4 lb. to 40 gallons of water, should be applied at least once a week.

In this State, mid-season or summer crops are only lightly infested, although in seasons when the moths are exceptionally numerous, extensive damage may occur.



1. Adult of the Tomato Caterpillar.
2. Pupa or Chrysalis. 3. Tomato Caterpillar.

Late crops, particularly in areas such as Somersby, Mangrove Mountain and Kulnura, on the Central Coast, should be sprayed and dusted at the intervals given above for crops grown in the early North Coast areas. The period when most severe infestations occur in these areas is from mid-February to about the end of March, and during this time the sprays should consist of lead arsenate powder 2 to 3 lb. to 40 gallons of water, and the dust a mixture consisting of lead arsenate powder 1 lb., kaolin 2 lb. (33 per cent. mixture).

In addition to the tomato caterpillar, it is frequently necessary to control other pests. Spring and autumn crops may be attacked by aphids, and during the summer and early autumn treatment of the plants in all parts of New South Wales is necessary to control mites. Various other pests also attack tomatoes, and particulars of these are given in Insect Pest Leaflet No. 72, which may be obtained from the Division of Information and Extension Services of this Department (Box 36A., G.P.O., Sydney).

Some insecticides may be mixed together and applied as a combined spray or dust. As it is necessary, also, to control various diseases of this crop, as well as insect pests and mites, growers are referred to Plant Disease Leaflet No. 84, and the inset thereto (also obtainable from the above Division), which gives particulars of the insecticides and fungicides that may be used in combination.

All tomatoes should be wiped or dipped upon picking, in order to remove arsenical residues. Information regarding dipping may be obtained on application to the Department.

In recent experiments, spray emulsions containing 0.1 per cent. and 0.05 per cent. D.D.T. proved effective in controlling tomato caterpillars attacking peaches.

Protection of Wild Flowers and Native Plants.

Regulations Governing Picking and Sale.

IN view of the opening of the wild flower season, it is desired again to bring under the notice of the general public the protection which has been placed by law over the picking of bush flowers and native plants, states the Minister for Local Government, Mr. Cahill. In an effort to preserve the native flora, the Government has prohibited the picking of protected flowers and plants, including most of the flowers and plants commonly met with in the bush lands, except on private property with the permission of the owner. The police are keeping a strict watch, and many honorary rangers have been appointed to see that the provisions of the law are observed.

Mr. Cahill also directs attention to the regulations under the Wild Flowers and Native Plants Protection (Amendment) Act, 1945, which came into force on 1st Augut, 1945. These regulations provide for the granting of growers' licenses to the owners or lessees of land, who are required, when selling the flowers, to affix to each bunch a label clearly indicating the name and address of the grower, and his license number. The practice whereby persons formerly sold the flowers picked from private property under permit from the owner or lessee is now a contravention of the Act, except in the case of Christmas bush, and members of the public are asked to co-operate in the enforcement of the new provisions by seeing that bunches of protected wild flowers, other than Christmas bush, purchased by them, bear the label of the licensed grower.

JETTING SHEEP TO CONTROL BLOWFLY INFESTATION.

The Advantages of a Systematic Programme.

DETAILS OF EQUIPMENT AND OPERATION.

R. N. McCULLOCH, B.Sc., B.Sc.Agr., Entomologist.

JETTING sheep consists of spraying the crutch area so as to "fill the wool" with a poisonous mixture—usually arsenical—to prevent blow fly infestation. Jetting was first used in about 1915; since then it has proved invaluable to many graziers, has been tried and abandoned by some, but never tried by a great many.

During the 1930's work by the Entomological Branch of the Department produced considerable improvement in jetting equipment (calcium arsenite mixture, multi-jet nozzles and an improved race), and proved beyond doubt the superiority of a systematic jetting programme over the dressing of struck sheep.

The Jetting Programme.

The Departmental experiments in the 1930's proved conclusively the great value of jetting and particularly the value of a systematic jetting programme. This programme may be set down as follows:—

Jet all the ewes when they show strike or the threat of strike, in the spring. Repeat the treatment as the sheep need it until the heat of summer stops fly activity or until mid-season crutching. In the autumn, again jet as soon as strike seems likely to appear, and repeat as required till winter or, in exceptional circumstances, till shearing. Try to be ahead of the flies all the time and aim at never dressing for crutch strike. Jet and rejet before hand-dressing is needed. The first jetting may normally be expected about six weeks after crutching or shearing.

This jetting programme means that in normal seasons sheep are crutched once and jetted four or five times in the year. In drought years the jetter may not be used at all. In bad fly years more than five jettings may be needed. But whatever the conditions, except for rare waves of body-strike, while flies are active station labour can control them by working at jetting for about ten days per month. The cost is about 1d. per head per annum for home-made jetting mix-

Fig. 1. Jetting Ewes and Marking Lambs in Temporary Yards at One Mustering.

tures and rather less for interest and depreciation in plant.

This programme, to be economical, must fit in with breeding and must not harm the sheep. In the experiments referred to above the ewes and rams were jetted whenever flies dictated it, except during lambing. Mating was not interfered with and no harm resulted.

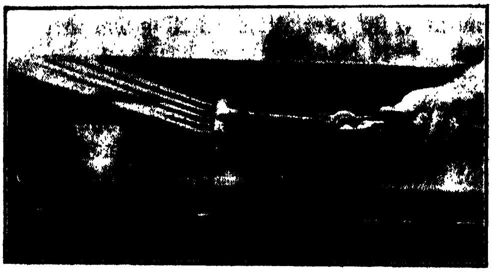


Fig. 2.—A Five-jet Nozzle.

Protection of Lambing Ewes.

Ewes were jetted about ten days before lambing began in the spring, and for several years they were done at lamb-marking. The lambs were caught from among the ewes which then passed on to a forcing pen, through the jetting race and out into the mothering-up yard. No harmful results were seen. Jetted flocks give slightly higher returns in lambs and wool, and lower death rates than did flocks managed by hand-dressing.

It must be noted, however, that jetting alone does not offer an ideal protection for lambing ewes if the ewes are "C" class (wrinkly crutched). Generally, jetting before lambing and at marking is adequate, but to guarantee the desired freedom through the normal lambing period of six or seven weeks the sheep must be plain in the crutch.

A Comparison with Other Methods.

The jetting programme involves allowing many sheep to show small strikes, and to receive no treatment except the next routine jetting. That the small strikes and the treating of them by jetting only do not harm the sheep, was shown by careful observation, weighing and valuing of individual fleeces in the long-term experiments referred to above.

In considering the adoption of a systematic jetting programme, any grower should study it carefully in relation to his circumstances and compare it with alternative methods.

In all "bad-fly districts" jetting is superior, except for the small properties, to the "one crutching plus hand-dressing routine," because it saves sheep (by reducing fly deaths virtually to nothing), saves wool (by avoiding the loss of wool crutched off in fly dressing), and saves in labour (by releasing labour from the constant work of dressing that goes on week after week under fly wave conditions in unjetted flocks).

For smaller properties, *e.g.*, of 2,500 sheep or less, repeated crutching is preferable where the owner can crutch all the ewes on the property quickly whenever he wishes to. Under these conditions the labour cost need not be charged against crutching, and an important difficulty for larger runs does not apply—the difficulty of getting labour to crutch all sheep immediately the decision to do so is made.

Fig. 3.—Operator wearing Face Screen, Canvas Sleeves, Rubber "Utility" or "Canning" Gloves and holding a Five-jet Nozzle.

Repeated crutching also has the disadvantage of reducing the return per head by about 2d. per year by shortening the staple of the crutch wool.

The above comparisons between (*a*) repeated jetting, (*b*) hand-dressing and (*c*) repeated crutching, apply to normally-developed Merino flocks. For perfectly plain breeched Merino sheep or crossbreds the

situation is quite different. For them jetting is probably only required in exceptional seasons, as when scouring after the breaking of a drought may make the plainest sheep for a time susceptible.

Anyone considering adopting jetting should first apply the Mules operation with complete thoroughness. After that, local experience will indicate whether jetting in addition is required.

smaller plant. The smallest complete (engine and pump) outfits have given excellent service for flocks of 3,000-5,000, but for larger flocks a larger machine is definitely worth while, chiefly because only the most powerful plants will deliver liquid fast enough to supply a large nozzle at steady pressure and allow the thorough treatment of 250-400 sheep per hour.

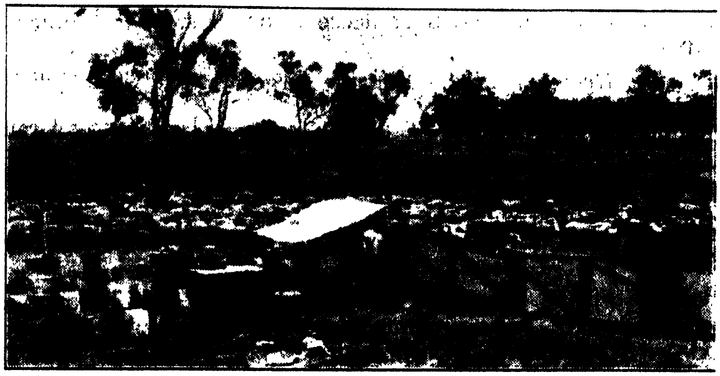


Fig. 4.—The Portable Race in Use in a Temporary Yard at Lambing Time.
The operator works at convenient height, adjusted by the depth (6 to 12 inches) of the hole in which he stands.

Body Strike.

Body strike is not affected by the jetting programme, a point sometimes made in decrying the value both of jetting and of the Mules operation. Objection to these valuable control measures on that ground is illogical, because crutch strike in Merino ewes is overwhelmingly the most important part of the blowfly problem. If crutch strike is controlled—and that state of affairs now seems definitely attainable—blowfly control in Merinos is reduced to the status of the problem of blowfly control in crossbreds, *i.e.*, no longer of major importance.

The Equipment Required.

The equipment required consists of a force pump with hose, nozzles, etc., a suitable race and additional items such as gloves and face screen for the operator(s).

Jetting Machines.

There are many good makes on the market at 10-15 per cent. above pre-war prices, with the maximum about £140 for pump and engine complete.

Jetting by hand pump is rarely economical. If a flock is too small to warrant power jetting, it is usually more economically managed by crutching. For similar reasons, of power plants it may be said that generally it pays to choose the bigger, rather than the

An arrangement that should always be considered is to have a jetting pump with tank of the larger type to be driven by an engine normally used for other work on the property. A jetting machine rarely works for more than 200 hours in a year, and often for less than 100 hours.

Nozzles.

The object of jetting is to saturate the crutch wool. This requires a pint or two of liquid (depending on wool-length) per sheep, which is left on the fleece after draining. It is impossible to throw at each sheep just that pint or quart and achieve saturation without run-off. Formerly, the general practice involved the use of small nozzles, giving small run-off and requiring high pressures to give penetration of the fleece. More recent experiments have shown the value of using big nozzles which give very fast delivery of liquid at low pressure. The advantages are safety (risk of pressure injury is avoided) and speed. The only disadvantage is that the run-off is so great that it is virtually essential to catch and re-use it. This in turn restricts the choice of jetting race.

Nozzle-size is limited by the capacity of the machine. Power machines have pressure control valves which are automatic but not perfect, and pressure gauges to assist in con-

trol. The valves cannot prevent all fluctuation as the cut-off is opened and shut. It is sound practice with any machine to fit the largest nozzle that will cause a fluctuation of not more than one-third in pressure; for example, if the pressure shown with the nozzle continuously open is 60 lb., the needle should not jump to more than 80 lb. per square inch when the cut-off is shut.

A multi-jet nozzle has the advantage over a large single nozzle in that it allows the saturation of a 4-inch strip of fleece at one sweep.

Nozzles Recommended.—For the largest machines, one hose with 5-jet nozzle is recommended, each jet 5/64 inch in bore; or if two hoses are used, each with a 5 x 1/16 inch nozzle. For the smallest power machines one hose with a 3-jet nozzle, each 1/16 inch bore.

Hose.

Because of the former demand for high pressures, many jetting plants have been fitted with expensive high pressure, 7-ply orchard spray hoses. These are so heavy and stiff as to interfere seriously with the work of the operator. A good quality garden hose will stand more than the pressures really needed in jetting and has the great advantages of lightness and flexibility. A 4-ply type gave complete satisfaction through several years of experimental jetting.

The Jetting Race.

Jetting races are of one or other of two main types—(*a*) The single-sheep raised race or pen; and (*b*) that shaped like a branding race with a concrete or wooden floor. Both types have been used in many modified patterns.

The Single-sheep Raised Race.

"TONONGA" TYPE.—The single-sheep raised race or box of which plans are given in a later section of this article, is referred to as the "Tononga" type because it was developed from original Queensland plans in the course of Departmental experiments carried out at Tononga Station, Moree. It is recommended for properties where two men are available for the work of jetting, with a third who can be called on if necessary for difficult sheep like weaners. The sheep walk through in single file; they are stopped one at a time by a gate which slides across the front of the box, prevented from backing by a rake hinged to the offside wall and jetted by an operator who stands in one place controlling door and rake with a single movement of one lever at his left hand.

Advantages of this race are considered to be—

1. Thoroughness of treatment because the sheep is presented to the operator at convenient height and crutch wrinkles may be opened without loss of time as the jet is applied.

Fig. 5.—Side View of Race showing Silt Trap.

The guttering receives fluid from trays under the main box and first section of the exit ramp.

2. Portability: the race can, if necessary, be moved daily and used in temporary yards.

3. All the immediate run-off is caught for return to the jetting machine. This keeps the ground dry for the operator and avoids waste and also the accumulation of arsenic in the yard.

4. Speed: if the race is well-made and well-managed, the nozzle may be kept going almost continuously with very short breaks between sheep, allowing 250-400 sheep to be jetted per hour.

Railway Quiz.

Human beings are very curious. From the cradle to the grave they go on asking questions. Undoubtedly the desire to know has made possible the great popularity of Quiz Sessions in radio programmes.

There is one little matter about which railwaymen are particularly curious. If there is anything that raises more questions than a railway they would like to know of it. It seems to them that there will be no end to the questions asked about locomotives, signals, tracks and the many other aspects of a railway system.

Somewhat in self-protection a booklet entitled "Railway Quiz" has been prepared. It contains the questions most frequently asked about the New South Wales Government Railways, and it sets forth the answers in non-technical terms. Copies of the "Railway Quiz" are now available. They may be obtained free upon application to the Public Relations Officer, 19 York Street, Sydney.

Will the distribution of this booklet reduce the number of questions? Or will it only serve to raise additional ones?

S. R. NICHOLAS,
Secretary for Railways.

Disadvantages of the "Tononga" type race are:—

1. It must be kept in good order; a small defect can make it virtually unworkable.

2. Protection for the operator's face and hands (face screen and rubber gloves) is essential.

3. The race, unmodified, is not ideal for rams. Rams can go through it with the ewes, but are more easily handled for crutch and head jetting in a branding race. On stud properties this race has been successfully adapted for rams by being widened to 18 and 20 inches with the rake capable of being shortened by some 4 inches.

PARTIALLY ROTATING BOX.—In this type the jetting section of the race is pivoted and is rotated by the operator as the sheep walks into it. The result is that the sheep to be jetted is cut off from the exit, and presented crutch-first to the operator, while the sheep behind it is cut off in the entrance ramp by a wing attached to the rotating box. The sheep being jetted is prevented from backing out of the box by bars bolted on to the entrance ramp or, preferably, by partial swaying of the box. By letting the sheep see the exit and the jetted flock in front, the skilled operator can keep it standing forward ready to run out when permitted.

Advantages of this type of race (sold prewar at £13 10s. 0d. in Moree without ramps or fluid-catching trays) are that it is ready-made and simple without adjustments, and that it is cleaner than the "Tononga" race for the operator, since he stands further from and behind the sheep.

Disadvantages are that the sheep cannot be handled during jetting, and treatment of difficult sheep is fairly sure to be less thorough than in the "Tononga" race.

PATENT SPRAY SADDLE RACE.—This is a single sheep race or box with a built-in patent spray saddle. The sheep is held in the box, the saddle is brought against the crutch, and the crutch area is saturated by a flood of liquid forced through numerous jets in the saddle. Excess liquid drains back to a sump, from which it is pumped into the saddle by a rotary pump. The pressure is in the 40-70 lb. range.

Advantages of this race appear to be—

1. The operator is completely protected from jetting fluid and requires no gloves, mask, etc.

2. No special skill is required to ensure that the sheep is well treated, provided care is taken to see that it sits properly against the saddle.

3. Saturation is automatic.

Disadvantages are—

1. Without an engine the machine costs slightly more than normal jetting outfits of the largest range. This puts it in the same class as the big-jetters most suitable for properties of over 8,000 sheep and it is definitely expensive for flocks of under 5,000.

Fig. 6.—The "Dewar" Step.
To prevent sheep backing out of the entrance ramp.

2. In its present form the machine is limited to the use of the soluble arsenite of soda jetting mixture, which gives slightly less protection than the insoluble calcium arsenite. As the speed of treatment with this machine is good (equal to that of big jetters) and the work less troublesome because of protection for the operator, this is not a very important point.

For larger properties or for communal ownership the patent spray saddle appears to be a very valuable development of the jetting machine.

Unfounded Prejudices.

Some prejudice exists against single sheep races. This is largely the result of bad construction or maintenance. Some owners also object because with a race of this type, normally only one hose is used. They overlook the fact that one hose with the fastest nozzle can take the output of the largest machines, while for very large flocks two jetting boxes can be worked with one machine from one forcing pen.

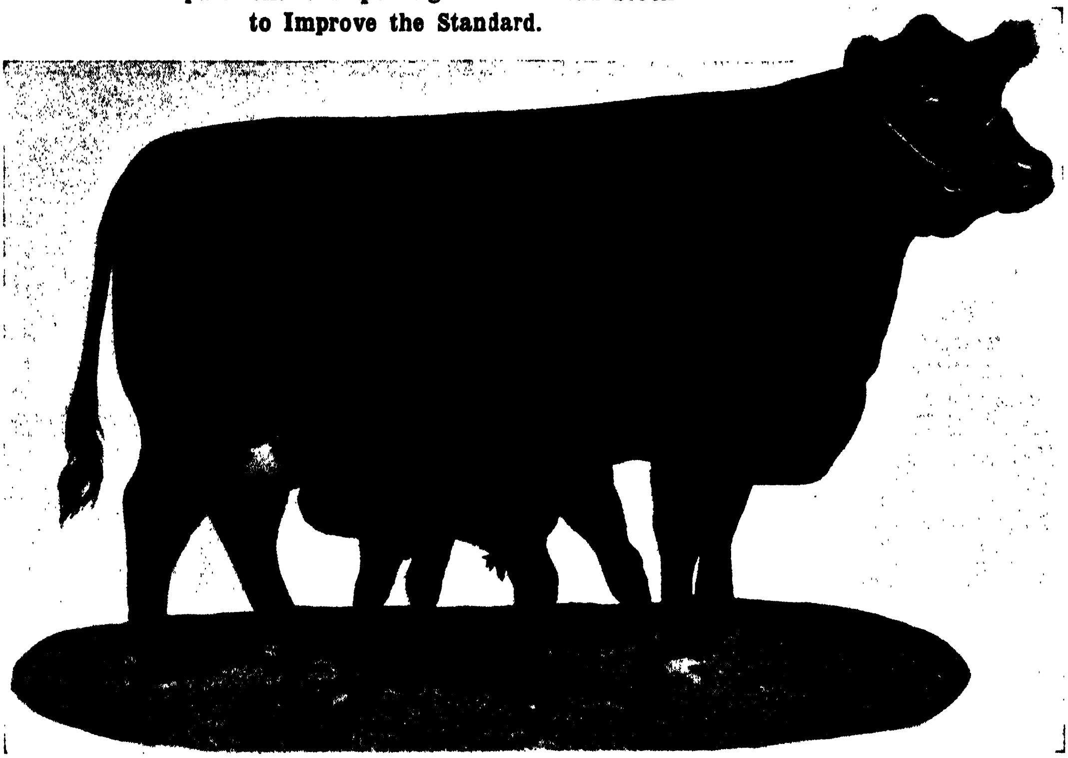
(*To be continued.*)

TYPICAL ABERDEEN ANGUS CATTLE—A High Quality Beef Breed.

The Sire is Half the Herd.
He must be of the right type—masculine, smooth-fleshed, with quiet temperament, and bred on sound blood lines.

We Look to the Dam for Sires and Steers.
She must come from a line of breeders, have a matronly appearance, and possess the ability to rear her calves.

The Department is Importing Further Stud Stock to Improve the Standard.



From Birth to Block the Steer Must Retain "Bloom." Good Feeding is Essential.

Ready for the Block.—A Combination of Quality and Weight.

INFERTILITY OF SHEEP

Associated with

PASTURAGE ON SUBTERRANEAN CLOVER.

CONTRIBUTED BY THE DIVISION OF ANIMAL INDUSTRY.

SUBTERRANEAN clover now figures so importantly in the feed of grazing animals over large sections of the southern half of the State and in the maintenance of the fertility of cereal land, that any development likely to affect its value for these purposes is a matter of concern to landholders.

The attention of sheepowners is drawn to reports of infertility in sheep pastured on early strain Subterranean clover.

Western Australian Experience.

Recently Dr. H. Bennetts and his co-workers in Western Australia described their research into a breeding problem of sheep which has assumed serious proportions throughout the areas of Dwalganup (early strain) Subterranean clover development of that State. The problem is manifested in three ways—infertility, difficult parturition and eversion of the womb.

At the time of writing Dr. Bennetts was of the opinion that the occurrences were associated exclusively or almost exclusively with pastures of the locally developed Dwalganup strain of early Subterranean clover. Rams apparently are not affected, but wethers and ewes exhibit extraordinary changes in their genital organs. Wethers may secrete milk and show overgrowth of the accessory genital glands; marked udder development and milk secretion occurs in maiden and unbred ewes. Ewes fail to breed in spite of repeated service by fertile rams, and, on microscopic examination degenerative changes are found in the wall of the womb. Development of the disease may be indicated by the sudden occurrence of many cases of difficult lambing, or less commonly by failure of the ewes to breed or by eversion of the womb. The infertility from year to year becomes progressively more serious until breeding is discontinued as unprofitable.

In Western Australia the problem may be expected to appear in any area where early strain Subterranean clover pastures are well established. The age of the Subterranean clover pastures appears to have little relationship to the occurrence of the problem. On some properties pastures had been established ten years or more before the disease became manifest; in others it appeared within a year or two of sowing Subterranean clover.

The economic importance of this condition is obvious. Not only is there a heavy annual loss from wastage of ewes and lambs, which virtually rules out sheep breeding, but some of the affected areas contain valuable stud flocks.

Occurrence in New South Wales.

Attention is drawn to this disease because during the past two or three months investigations in New South Wales have shown that it is making its appearance here on pastures predominantly Subterranean clover. So far the losses in this State have not been heavy, but judging from the Western Australian experience, the losses may become progressively greater from year to year on affected properties.

Research had not advanced to a stage when any recommendation can be made to control this disease. The problem is exceedingly complex and much investigation will probably be necessary before a method of preventing the condition will be discovered. In the meantime, any grazier who has experienced poor breeding results, and many cases of difficult lambing, should get in touch with his district Stock Inspector so that the incidence of the condition in this State can be ascertained.

It is realised that mid-season Subterranean clover has been grown on extensive areas for prolonged periods without any evidence of ill effects.

If sheep could talk you'd hear those heartfelt words — so . . . this year don't risk flock losses through gastro-intestinal worms. Take a tip from flock-wise graziers and drench with "Phenovis" — the effective gastro-intestinal worm remedy. "Phenovis" is based on Phenothiazine — the only drench controlling all three of the worst worm parasites in sheep — nodule, large stomach and black scour, and gastro-intestinal worms in other stock.

"Phenovis" is non-toxic to sheep when used as directed and is supplied ready to use in handy powder form. Simply mix with water and drench as directed.

**Available in
1 LB. TINS, 7/-
7 LB BAGS, 6/8 PER LB.
Freight and postage extra.**

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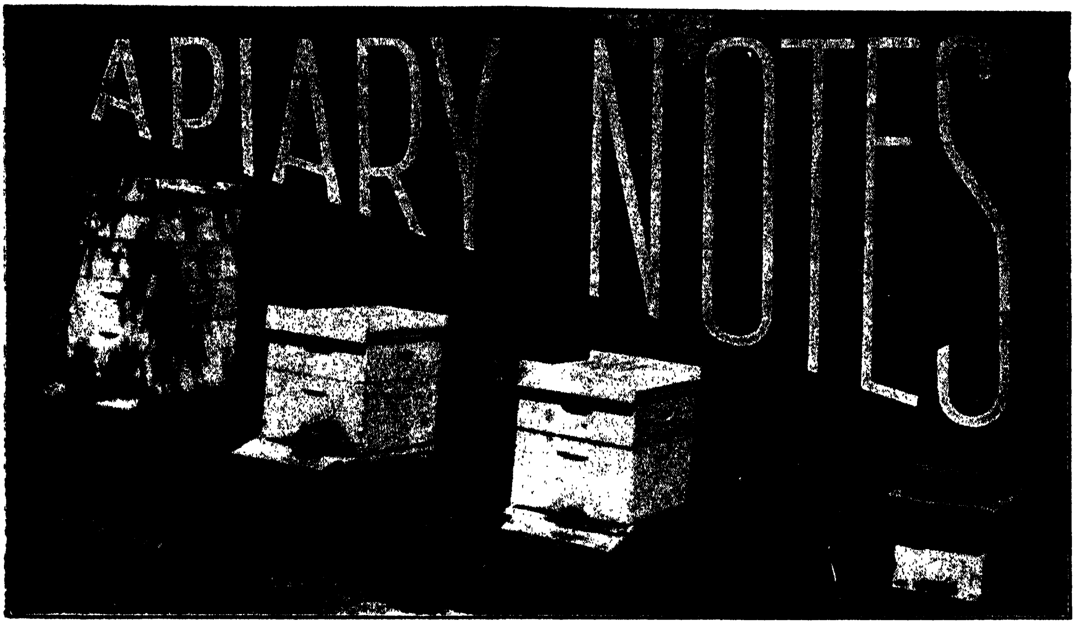


The Importance of . . . .

QUALITY IN COMBS.

Hints on Care, Manipulation and Culling.

D. MORISON, B.V.Sc., Apiary Branch.

THE framed comb is the unit which enables the beekeeper to manipulate the brood and honey. Much of the success of some beekeepers can be attributed to the good quality of their combs, and to the care given to manipulation and treatment.

Ideal Conditions for Comb Drawing.

Combs vary considerably in quality, and it is of interest first of all to consider the conditions under which ideal combs are drawn by bees. They are as follows:—

1. *There should be a large number of young worker bees in the colony,* for these are the bees which secrete the wax.

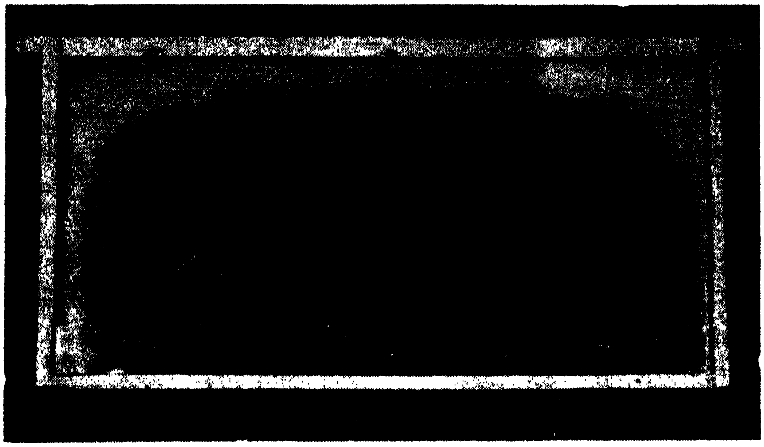
2. *A honey flow should be on,* for this enables the young bees to secrete wax profusely. Bees will not secrete wax in quantity, using stored honey, even though a considerable amount be present in the hive.

3. *Warm conditions should prevail,* because if the weather is very cold the bees cannot spread evenly over the foundation and the combs are drawn unevenly. Perhaps the centre and lower edge of the sheet is drawn while the remainder is neglected. Under extreme conditions the bees may content themselves with the building of much burr-comb between the combs already occupied, being unable to expand on to the foundation.

Management During Comb Production.

Having satisfied himself that these favourable conditions prevail, a beekeeper wishing to have first-class combs drawn should pay particular attention to methods of management.

First make certain that the frames are properly nailed and wired, and that a full sheet of foundation is firmly embedded in each. Then place these frames, fitted with



A Brood Comb of Excellent Quality.

The darkened portion denotes the portion in which brood has been reared.

Such combs are only drawn under ideal conditions as indicated in this article.

the foundation, into hives where the bees can readily spread over them and draw them quickly and evenly. Do not make the mistake of giving a weak colony more frames of foundation than it is able to cope with, as irregularly built combs are likely to result from this practice.

Whilst it may be necessary to hold frames of foundation on hand for some time, as when anticipating a heavy season, the best results are usually secured by fastening the foundations in prepared frames immediately before they are required for use by the bees. Such foundation is then less likely to buckle or become detached from the top bar, etc.

If foundation is given to colonies when conditions are unsuitable for comb building, the bees may damage it considerably by chewing holes in it, especially along the wires, and when comb is eventually built on this foundation, it will be of an irregular nature.

Common Faults in Combs and Their Causes.

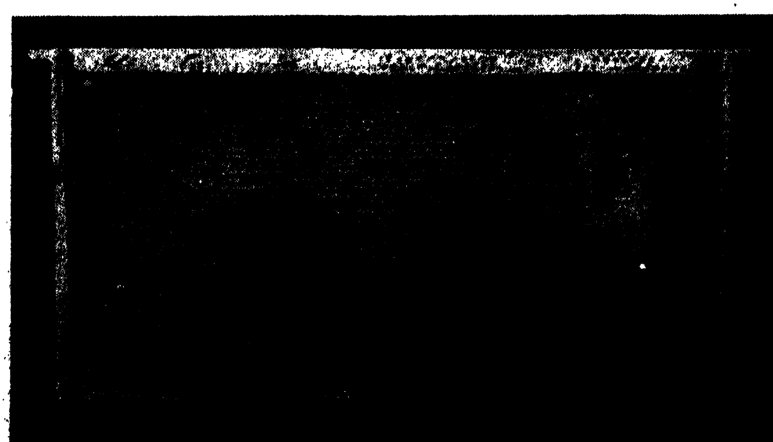
The common faults found in combs are:

(1) Incompleteness and irregularity; (2) buckling and sagging; (3) lack of straightness; (4) the presence of drone comb (not always a fault).

1. *Incompleteness and Irregularity.*—If the bees have been allowed to build combs haphazardly, it may be found that they have not built complete combs in the frames. At times, too, completed combs may be damaged by mice, wax-moth, etc. The bees may make repairs when conditions are suitable, but they often fill in the spaces with drone comb.

A Drawn Comb, showing Damage by Mice in the Top Right-hand Corner.

Also slight irregularity towards the lower edge—this type f defect often occurs when the comb has been damaged in the extractor.



Combs which have been transferred from bee-trees and box hives to regulation material are often very irregular and incomplete, and should be culled when possible.

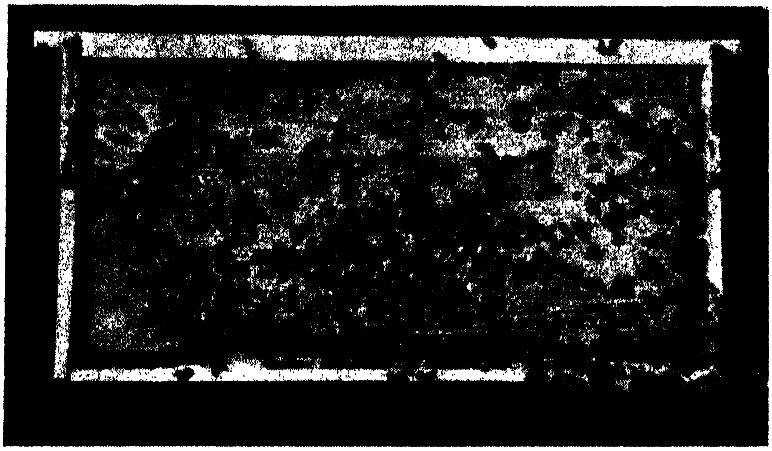
2. *Buckling and Sagging.*—Sometimes the foundation used has been allowed to remain in the frame for a period and become warped before it is drawn by the bees, and a buckled comb results. During hot weather a new comb heavy with honey may drop, with the result that some drone comb is developed beneath the top-bar, and compression or buckling of the comb may be apparent an inch or two above the bottom bar.

into the brood-nests of queens from which the drones to be used in the mating programme are required.

The Culling of Combs.

While it is usual to find a small percentage of defective combs in every apiary, the efficient beekeeper should make an effort to reduce the number to as few as possible.

The culling of combs should be carried out when they contain little or no honey or brood—usually in the early spring. If defective combs are worked to the outside of the brood nest and to the walls of the supers, they are less likely to contain brood. This simplifies the culling process.



A Well-packed Frame of Brood.
The comb is of good type, except for the bottom left-hand corner, which consists of undrawn foundation.

3. *Crookedness.*—This may be apparent in naturally built or transferred combs, or combs which have been built on crooked foundation. An extreme case occurs when the bees do not build the combs straight along the frames, but across them; these are referred to as cross-combs. Beekeepers are prohibited by law from having combs of this type in their hives, since the frames cannot be removed for inspection or other purposes.

4. *The Presence of Drone Comb.*—The presence of a large amount of drone cells in the average brood comb is considered to be a fault, but bees usually tend to build more drone comb than is commercially desirable. However, the beekeeper engaged in queen breeding will require to have a number of combs containing a percentage of drone cells on hand, so that these can be inserted

Old, thick brood combs should be discarded.

Extracting time offers the apiarist an opportunity for the culling of combs, which may be examined after having been through the extractor. Such cull combs should be melted up and pressed for their wax content.

Handling and Storing Combs.

Much can be done to minimise the number of combs which have to be culled by taking adequate care, not only in the handling of them, but in the storage as well.

When handling combs, be careful not to break the lugs of the top-bar or split the shoulders off the end-bars of the frames. This is especially likely to occur in cold weather with heavily-propolised frames.

Care should be exercised with the combs during extracting operations, especially new combs. If a radial type extractor is rotated too rapidly, new combs tend to creep to the top, or to break sideways if the extractor is of the Cowan type.

When combs are stored for subsequent use when conditions for the bees improve, precautions should be taken to see that no damage occurs to them from such agencies as mice or wax moth.

Since the comb is the unit on which apiary operations are based, it will be found that any improvement in the standard of combs will enable the beekeeper to carry out his work with greater ease and efficiency.

"Progressive Farmer" Returns.

MR. A. K. GARDINER, of King's Plains, via Blayney, winner of the recent Progressive Farmer Competition conducted by the Agricultural Bureau of New South Wales, returned to Sydney on the m.v. *Monterey* on 17th October, having completed a tour of agricultural areas of the United States.

While on his tour Mr. Gardiner visited and inspected farms and ranches of all description, universities and agricultural institutions, studying American farming methods from every angle, including marketing and packaging of farm produce. He attended many conferences, and addressed public meetings giving the Australian farmers' outlook to their American counterparts.

Reports received from America state that Mr. Gardiner has been an excellent ambassador for Australian farmers.

The sponsors of the competition were the Rural Bank and Broadcasting Station 2GZ, who shared all expenses connected with it and the tour.

Sale of Immature Tomatoes Illegal.

ACTION is being taken to prevent the sale of immature tomatoes. The practice is illegal and renders growers liable to a penalty of £50, in addition to the seizure of their tomatoes.

Issuing a warning along these lines, the Minister for Agriculture, Mr. Graham, said considerable quantities of immature tomatoes had been arriving on the Sydney market. Regulations required that tomatoes offered for sale should be mature, which meant that the colour of the skin should have changed from dull-green to bright red and the flesh around the seed from a light-green to a deep amber or an amber tinged with pink. Where that stage had not been reached, the tomato would not ripen properly and would in most cases break down or shrivel. The regulations also required that tomatoes should be firm and not damaged by disease, insects, decay or sunburn, or in any other way likely to cause leakage or to affect the appearance of the fruit. The maximum variation in diameter of fruit must not exceed one inch.

To date Departmental inspectors had merely taken action to prevent the sale of immature tomatoes. The Minister pointed out, however, that growers who infringed the regulations were liable to a penalty of £50, and the tomatoes may be seized. He was hopeful, said Mr. Graham, that growers concerned would co-operate fully in complying with the requirements of the regulations, thus avoiding the necessity for more drastic action.

Control of Flies in Dairy Premises.

FLIES are carriers of many infections, and the refuse in which they breed—decaying vegetable matter, old rags and paper, and manure—should not be tolerated in the neighbourhood of the dairy.

Strict sanitation in this respect is important in the control of contamination of dairy products. All properly-equipped premises should be provided with a barrow, shovel and broom in the milking yard. After each milking the concrete surfaces of milking sheds and inner yard should be swept, dung and litter removed to the dung heap or bins, and the floors washed down. Sweeping should not be commenced until the milk and cream have been removed from the vicinity of the bails, etc.; or where milk and cream are stored adjacent to the bails until the concrete surfaces to be swept have been thoroughly damped with water to reduce the risks of contamination from dust.

The surface of the main yard should be kept clean, and the dung and litter removed to the bins daily. Dung heaps or bins should be kept not less than 30 yards from bails, milk-rooms and yards. They should be situated where prevailing winds will not convey air-borne infection to the dairy premises.

The surroundings of yards should be kept clean and tidy, and when cattle are allowed to camp near yards the droppings should be cleaned up frequently—not less often than once weekly.

That's the story of the successful tomato grower—the man who saves three quarters of his cultivation time, cuts his operating costs by half, and auto-cultivates his land instead of dragging an anchor through it . . . ploughing, discing and harrowing are usually unnecessary and certainly costly in cash, time and results.

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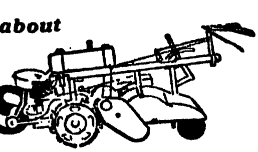

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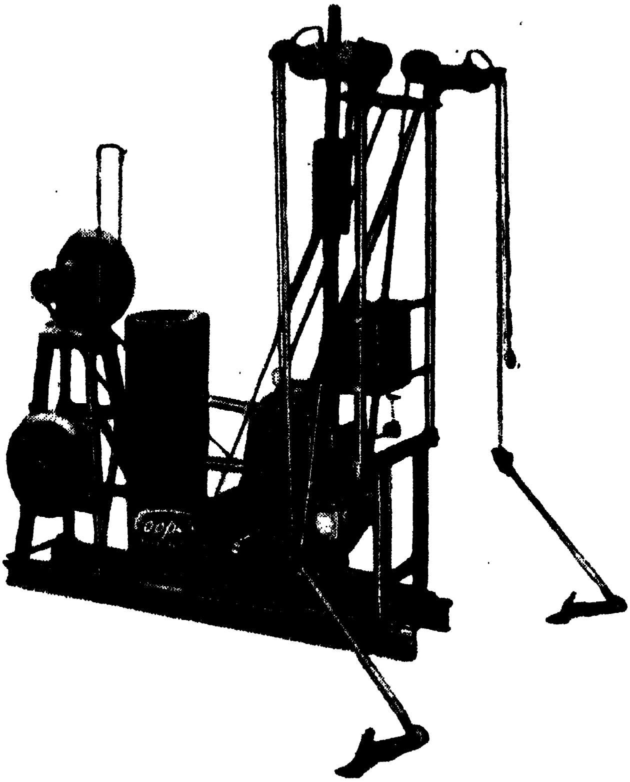


INLAND DAIRYING.

Value of Spread of Production.

Lessons from the Forbes Dairy Society's Competition.

J. W. DAVISON, Senior Dairy Instructor, and E. A. GRANT, Dairy Instructor.*

TO publicise the importance of and the possibilities of dairying in the Lachlan Valley, the directors and management of the Forbes Dairy Society sponsored a dairy farm production competition during the period July, 1945, to June, 1946, awarding prize-money to the value of £75 (£40, £20 and £15).

The following extracts from the judges' report on the entries will be of interest to inland dairymen generally.

Objects aimed at in the competition were:—

(1) An increase in yearly production.

(2) An increase in production over the four critical months of the year—March, April, May and June—thus creating a "spread" in farm production, which would help the Company to avoid heavy purchases of dairy produce from other centres during that period.

(3) Better breeding, feeding and handling of dairy stock and better farm practices.

It was thus the purpose of the Competition to show which farmer supplying the Company had achieved the greatest progress and the greatest increased production for the twelve months, with emphasis on production during the months March-June.

The Scale of Points.

The competition was judged under a scale of points, as follows:—

	Points.
1. Layout of farm and dairy buildings	200
2. Improvements to buildings over twelve months ..	200
3. Herd improvements over twelve months	200
4. Feeding in relation to costs and capacity of farm ..	200
5. Improvements, cropping, pastures, rotational grazing ..	200
6. Increased production ..	1,500

Quality Clause.—A penalty clause of 1 point, for every 10 gallons or part thereof of milk, to be deducted on all rejected cans, also on each can of cream, or part thereof, graded 2nd grade.

In designing the competition points a wide variety of farms and farmers had to be catered for. Conditions had to be moulded to suit men who were "dry farming" in wheat areas as well as others who had river frontages, and possibly irrigation plants. In view of the fact that, in addition to dairying, some competitors were also sheep breeders or engaged in vegetable or lucerne production, farm acreage was ignored and points for increased production became the final dominant factor.

Although most points were awarded for total production figures for the current year, provision for increased production in future years was not neglected, and it is hoped that the emphasis given to continuity of production will make it the aim of every farmer who cares to profit from the lessons of the competition. How important is this continuity or spread of production can be seen by the figures discussed below.

The Importance of Continuity of Supply.

Originally there were ten competitors, one of whom dropped out, and two were disqualified as non-suppliers when the year ended, so that seven completed the competition. A comparison has been made in the following table of the yearly production of these seven competiors with that of the

*Judges of the Competition.

other suppliers to the factory, in respect of this matter of distribution of production.

	Production 1945–46. *For Seven Competitors.*	*Production of Other Suppliers.*
	Per cent.	*Per cent.*
July-October	44	53
November-February	37	32
March-June	19	15

In the case of the seven competitors, less than half of the production was obtained in the first four months of the year, although the production for the month of October—15 per cent. of the yearly total—was a little behind the total for the last quarter of the year. July-October production for the other suppliers was 53 per cent.

Three of the seven competitors actually increased production over the four months, March-June, by 76, 81 and 183 per cent. respectively.

A Discussion of the Scale of Points.

The accompanying table shows details of the points allotted in each section, together with the points scored by the three leading competitors. There are several items in the scale of points which it is desired to mention particularly.

It will be noted that (in Section 3) the herd sire has a value twice that of the cows in milk. It is possible that the allocation of 100 points, *i.e.*, half the points for this section, would not have placed too high a value on the importance of the sire.

It will be seen that in Section 5 only 40 points are allocated for irrigation. These points, of course, take into consideration the provision of irrigation plant and its proper use. It might be thought that the provision of such an expensive plant should be worthy of high evaluation—as against, for instance, 80 points for the provision of feed stalls.

However, it was obvious that any supplier using irrigation intelligently would, or should, ultimately score heavily on the production side, as green feed should be available from irrigated areas nearly all the year round. Any increase in points for this section would have unduly handicapped competitors who were not on the river. It will be noted that such competitors were provided for in Section 2. Furthermore, it would be possible for any such competitors to secure points for production by proper

TABLE SHOWING DETAILS OF THE SCALE OF POINTS OF THE COMPETITION TOGETHER WITH THE POINTS SCORED BY THE THREE LEADING COMPETITORS.

	Maximum Score.	Mr. T. S. Radburn	Mr. H. J. Mac-kenzie.	Mr. F. McGrath
Section 1: *Layout of Farm and Dairy Buildings*—				
Hygiene	10	9	8	7
Standard of buildings	20	18	15	16
Layout, machines and plant ...	10	9	7	7
Water for stock at bails and dairy	30	15	30	28
Feed sheds	80	...	...	...
Hay shed	30	...	20	...
Silos (pit or tub)	20	...	...	...
Total	200	51	80	58
Section 2: *Improvements to Buildings over 12 months*—				
Feed stalls	80	...	...	...
Hay shed	30	...	...	...
Silos	20	...	...	...
Water improvements	30	...	...	...
Improvements to bails and dairy	20	7	...	...
Layout, approaches and plant	10	4	...	...
New yards, surfaces, fences ...	10	8	...	...
Total	200	19	...	...
Section 3: *Herd Values and Improvements over 12 months*—				
Records of service, calvings, etc.	10	...	...	...
Calf yards, water for calves, shed	10	...	8	...
Methods of rearing and feeding	30	25	12	8
Sire or sires in use	80	76	70	76
Condition and quality of milkers	40	38	33	35
Condition and quality of dry stock	30	26	20	27
Total	200	165	143	146
Section 4: *Feeding in Relation to Costs and Capacity of Farm*—				
Feeding at bails or stalls ...	40	5	...	6
Use of home grown feeds ...	80	65	75	60
Feed reserves for milkers ...	70	40	65	62
Use of licks or salt	10	...	5	5
Total	200	110	145	133
Section 5: *Improvements, Cropping, Pastures, Rotational Grazing*—				
Irrigation and use thereof ...	40	40	...	...
Layout of paddocks, etc. ...	40	34	15	25
Type, suitability, quality of crop	40	30	35	35
Type, suitability, quality of pastures	40	22	32	32
Water for stock in paddocks ...	40	30	10	10
Total	200	156	92	102
Section 6: *Increased Production*—				
Increased production for 1945–46 over the year 1944–45 ...	1,000	676	...	...
Increased production for March, April, May, June, 1946 ...	500	405	500	380
Total	1,500	1,081	500	380
Grand Total for Competitors	...	1,582	960	819
Less Quality Penalty ...	...	1	37	17
Less Decreased Production Penalty over 12 months	...	...	50	180
Net Grand Total ...	...	1,581	873	622

feeding, as well as additional points in Section 4 for feed reserves.

In Section 4 there are two items which require brief explanation. To evaluate feeding methods it was necessary to plan a standard feed which could be fed by every farmer in the competition. The standard chosen was as follows:—

20 lb. Cereal hay	..	20 points.
5 lb. Lucerne ..	..	10 points.
3 lb. Grain ..	..	10 points.

Although this is not a balanced ration and lacks somewhat in palatability and succulence, the feeding of such a ration to all milkers in the Forbes district over the worst five months of the year would have brought about a large increase in supplies to Forbes Factory. Points for feeding were allowed on this basis when the cows were hand-fed in paddocks as well as for feeding at stalls. Points for feed reserves were calculated on the basis that it was necessary to provide a ration of this standard for all the milkers in the herd for five months.

The Weather Conditions.

Following a year of extreme drought, a fairly good spring was experienced, but dry conditions commenced again in February and an autumn of record low rainfall followed. Rainfall for the year at Forbes was 15.7 inches—approximately 6 inches below normal. It will be seen that for six months of the year all competitors were battling against extreme weather conditions, and the year was anything but favourable to high production.

THE STANDARD OF THE ENTRIES.

Observations made on the properties entered in the competition are briefly set out below:—

Section 1.—Dairy Buildings.

The standard of dairy buildings was very good. Milking machines were in use by all competitors, but only three had feed stalls. The lesson to be learned here is that it is not necessary to erect ultra-expensive feed stalls in which to feed stock; practicability should be the key word.

Section 2.—Improvements to Farm Buildings Over Twelve Months.

Very few competitors scored points in this section. Only one silo was noted. In view of the fact that succulence and palatability are missing in feed available for stock during the January-April period every year, the sinking of pit silos and conservation of cereal crops to meet such an emergency is recommended to all dairymen.

Section 3.—The Herd.

Many of the sires and herds inspected scored heavily, but on some farms serious weaknesses were observed. It is desired to mention two, in particular, viz. (*a*) failure to keep stock records; and (*b*) failure to rear calves properly.

Until Forbes dairymen make a determined effort to keep proper farm records, orderly and economic marketing of their products is impossible. With cows coming in just as nature decides, flush periods occur, resulting in a heavy percentage of milk being separated, for which the farmer receives only butter-fat rates of pay. "Spread" of production is not possible without proper records, and "spread" of production, when properly applied, should mean an increase in yearly income to milk suppliers of over 30 per cent.

The simplest and most efficient way of obtaining proper stock records is by joining the local Herd Recording Unit. At a cost of 4d. per cow per month for grade cows, the farmer secures a complete record of everything that appertains to his herd, as a complete card index is built up to cover the whole herd. Amongst many other advantages, the value of the sire of the stock being tested is indicated, and the "passengers" in the herd are shown up.

Some very promising young heifers were inspected, but the judges gained the impression that on some farms it was a case of survival of the fittest so far as young stock were concerned. In far too many cases, well-bred young heifers were found tied up to a fence without shade or water. Females were being replaced by purchase, rather than by breeding and proper methods of rearing. It is suspected that mortality in calves under six months of age is very high.

Section 4.—Feeding.

The conditions of the competition called for two visits to each farmer. In all, nineteen visits were made to the farms concerned, the second visit to each farm dealing largely with improvements made over twelve months, and in particular, with feeding methods employed.

No farmer gained anything like full points for feeding, though on some farms, ample feed reserves were in hand. The possibility of a dry, hard winter may have been responsible for the poor rations some stock were receiving. Good use was made of home-grown feeds generally, plenty of cereal hay being available. Grain was in short supply on some farms.

More use could be made of lucerne, particularly for feed reserves.

Section 5.—Improvements, Crops and Pastures.

Irrigationists scored well in this section, which however showed up two outstanding weaknesses, viz., (*a*) absence of any farm planning; and (*b*) failure to provide adequate water in paddocks for stock. On one or two farms, too much reliance was placed on one crop farming—generally cereals planted in the same paddock year after year. Crop rotation is definitely needed on such farms.

Lack of Planning.—It is very hard to convince any farmer that it pays to plan or remodel a farm. Nevertheless, planning does bring about economic gains. Consider the man-hours lost in shepherding a herd of cows around, or across a growing crop to distant paddocks, and the time spent each year in opening gates. Whole herds have suffered in bush fires because of such factors. Consider the size of the paddocks in relation to the "grazing day" of the herd; also the endless journeys to let the herd out for water. The provision of one or more central lanes would do much to facilitate the handling of stock.

Provision of Water in Paddocks.—The only competitor who scored full points in this section was a supplier in a wheat area who had a good tank in each paddock. He was fortunate in having sufficient "run off"; at least five of the competitors would not be so favoured. Stock water supply at the bails was generally pretty good, but paddock water supplies need to be improved.

Cows prefer to drink from a good iron or concrete trough than from the river. This statement will surprise some farmers, but it has been proved over and over again. As far as the Goolagong Flats are concerned, the provision of a small additional windmill and a concrete trough situated, if possible, to serve two or three paddocks would be a boon well worth the small capital cost, for plenty of good clean water is necessary to the health of stock and for production of milk. Such a step would save unnecessary travelling by stock and time spent in watering. A heavy producing cow on a hot, dry day will drink perhaps 20 gallons of water, and it should be provided at a convenient place. Shade for milkers was good on all farms except two.

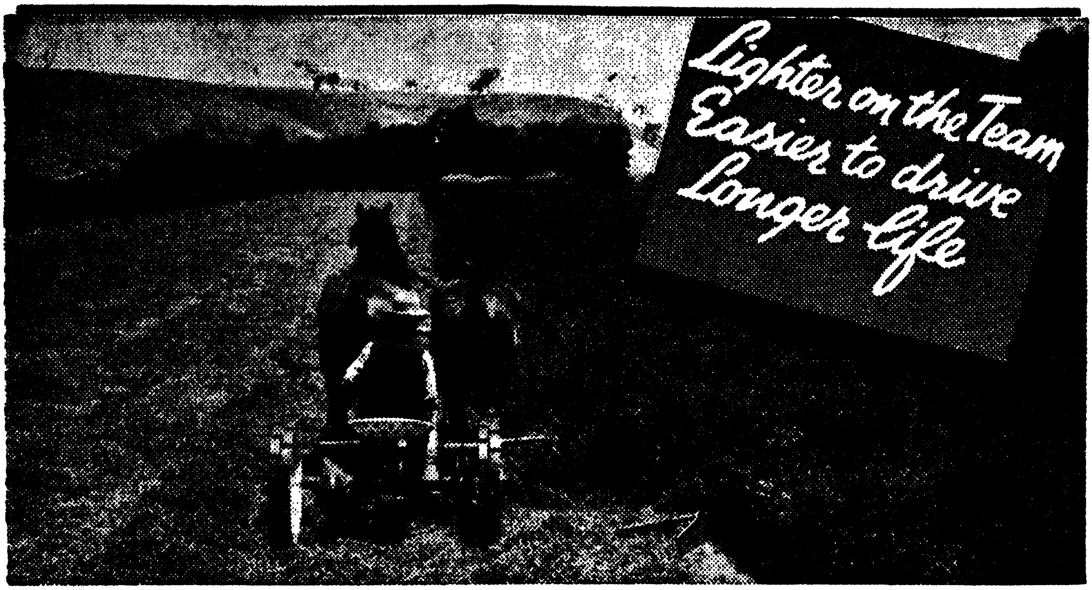
Crops and Pastures.—Dairymen in the Forbes district place too much reliance on barley grass plus oats. Such a programme has limited possibilities.

Insufficient use is being made of lucerne for grazing, Wimmera rye and lucerne, and Japanese millet as a summer fodder crop. Old thistle-infested lucerne might be conserved as silage. Better results were obtained from Japanese millet when rate of seeding was doubled—to about 20 lb. per acre. Local practice seems to be to sow about 9 lb. per acre. Heavier sowings help to keep early weed growth in check.

Production in the drier months of the year and condition of the herds would indicate that the sparse grazing provided—very often on stubble—plus a little cereal hay sometimes thrown out to the cows, is providing a maintenance ration only. Cows look to be in good nick—but there is no milk flow. Examination of milk receipts from suppliers supports this view. A milking cow requires in her ration a heavy protein supplement. The best and cheapest way to supply this in the Forbes district is by the use of lucerne, as green feed, as part of a pasture mixture, or as hay. The most economical way is in the form of pasture, letting the cow do the work of harvesting.

Section 6.—Production.

As a possible score, 1,000 points were awarded. Where a supplier increased his production in the competition year over the "comparison" year, he was awarded points according to his percentage increase. Conversely where a supplier failed to reach the total production of his "comparison" year he was penalised according to his percentage decrease. In addition 500 points were awarded as a possible score for increased production over the critical months of March-June and suppliers scored according to their percentage increase in production for this period.



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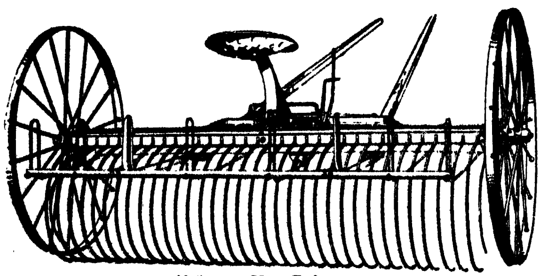

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Quality.

The standard of quality left something to be desired. Too often high acid milk was received at the Factory and senders were penalised.

There is urgent need for all milk to be cooled immediately after milking. Forbes Factory is prepared to supply small coolers at cost, and this is a matter that should have the attention of every dairyman.

THE PRIZE WINNERS.

Places in the competition were filled by—First: Mr. T. J. Radburn, South Condobolin road, Forbes; second, Mr. H. J. Mackenzie, Goolagong; and third, Mr. F. McGrath, Goolagong. Mr. Radburn well deserves the £40 awarded for first prize.

Brief descriptions are given of these three entries.

First Prize Winner—Mr. Radburn.

Mr. Radburn farms an area of 124 acres, of which 20 acres is reserved for pig raising. A few weeks before the competition ended he secured a lease of an additional 60 acres. This was put into use as a dry run. Approximately one quarter of the area is under irrigation.

The farm carried an average of twenty-eight milkers for the period under review. The herd was recently increased by judicious purchase of good Australian Illawarra Shorthorn stock. The property now carries approximately fifty head of mature cattle as well as calves and 30-40 pigs. All poor producers have been culled from herd.

During the year Mr. Radburn increased his production over the "comparison" year by 67.6 per cent., and his production during the critical four months by 81 per cent. His yearly increase amounted to 7,145 gallons and the increase in the March-June period was 1,605 gallons, compared with the 1944 period.

Much of Mr. Radburn's success can be attributed to culling of non-producers, provision of ample green grazing in the form of irrigated pasture, particularly protein-rich green lucerne.

An area of 7½ acres of lucerne, watered at least once a month, is reserved for grazing, and 8 acres of lucerne is reserved for hay, but is sometimes grazed after cutting. Japanese millet (19 acres), watered every fifth day after reaching the grazing stage, gave excellent feed.

Mr. Radburn believes in keeping the cows grazing, not standing around the bails, and with that end in view he extended his bails and put in an additional milking machine unit. Milkers were fed additional wheaten hay for the last six weeks of the competition.

Second Prize Winner—Mr. H. J. Mackenzie, Goolagong.

Second prize (£20) was won by Mr. Mackenzie.

Production on this farm of 210 acres is generally confined to dairying, though wheat and hay has been sold in favourable years. This property is a bit lighter than some of the better Goolagong flats, but is good carrying country. Mr. Mackenzie just failed to reach his "comparison year" total, but secured an increase of 183 per cent. over the four critical months, March-June, for which production section he secured full points.

This farmer scored well in Sections 3, 4 and 6. He has good paddocks of lucerne and trefoil and rye is used in grass mixtures. Excellent use is made of lucerne for grazing and for feed reserves, of which good supplies were on hand.

About an average of twenty milkers was carried through the season. Good lucerne (28 acres) grazed when necessary, and in good years giving three light cuts, together with 30 acres rye and lucerne and 30-40 acres grazing oats each year, proved an excellent standby for milkers. Oats (70 bags) was stored for winter requirements.

More shade is needed in some paddocks. The provision of one central laneway, and water for stock in grazing paddocks would improve production, and the provision of feed stalls for autumn feeding is a desirable improvement.

Third Prize Winner—Mr. F. McGrath, Goolagong.

Mr. McGrath, who won third prize (£15), farms a very rich pocket close to the township. He did not reach his "comparison year" total, but secured an excellent increase during the four critical months—

76 per cent.—for which he received 380 points in the production section.

The provision of feed stalls, a pit silo and better arrangements for watering stock in paddocks are suggested for this farm.

Milkers varied from 13 to 25 throughout the year.

Good results were obtained on this farm by doubling the locally accepted sowing rate per acre of Japanese millet.

Perhaps too much reliance is placed on cereal cropping. Some of the old lucerne paddocks are thistle infested. It is possible that good silage could be made from such a mixture. Twenty-five acres of fair lucerne and 18 acres of Japanese millet provided good grazing. There was plenty of green oats in winter, and good feed reserves on hand.

Dry Cows Must be Fed.

ON many dairies cattle are brought straight from the dry paddocks—often the poorest on the farm—without any attempt to build up condition to fit them for the strain of milk production. Good production cannot be obtained from such cattle. Unless cattle are in good condition at calving, that is, with reserves of fat and protein built up during the dry period, milk production will never reach a high level.

This is due to the fact that many cattle cannot eat enough feed for the high production of the first few months after calving, and must draw on body reserves. If these reserves are not available, milk production cannot reach its maximum. Also, there is more tendency to digestive disorders if, when hand-feeding, cattle are brought straight from poor feed on to a ration containing, perhaps, a large proportion of concentrates.

A good general recommendation where cattle are not on first-class pasture is for the dry cows to be given 5 lb. of concentrates per day for six weeks before calving, in addition to a full feed of roughage. The food thus invested in building up the cattle is far from wasted. It usually pays for itself several times over.

For example, 5 lb. of oats per day for six weeks before calving would take 15s. worth of oats at 3s. a bushel. An increase of only 20 gallons of milk over the lactation at 9d. a gallon or only 10 gallons at 1s. 6d. per gallon is required to pay for this feed. By building up cattle in this way before calving, an increase of from 100 to 300 gallons over the previous lactation can be obtained.

The 32-page pamphlet entitled "Feeding for Milk Production" from which the foregoing paragraphs are taken is obtainable free on application to the Division of Information and Extension Services, Department of Agriculture, Box 36A, G.P.O., Sydney.

"Overstocking" Dairy Cows is an Objectionable Practice.

WHEN newly calved cattle are displayed for sale, it frequently happens that the owner, desiring to attract attention to the capacity of the udder, does not draw off the milk, and the cattle remain for a considerable period with the udder distended in excess of its normal full condition. This practice is known as "over-stocking" and is a recognised procedure, not only at country cattle sales but also with cattle brought into urban areas for sale to city and suburban milk vendors.

Although overstocking is a recognised practice, it is objectionable for the following reasons:—

1. It causes considerable discomfort to the cow.

2. An overstocked udder is much more liable to suffer injury than one not so distended.

3. An udder which is overstocked too long will become congested and is liable to an attack of mastitis.

4. Should the cow be infected with the germs which cause contagious mastitis, the retained milk will be a good medium for the multiplication of the organisms and an acute attack of contagious mastitis may follow.

Loss Through Neglect of Farm Machinery.

A SERIOUS cause of loss on many farms is that due to neglect of farm machinery. Such loss takes place in many ways. It may be put down to three chief causes:—

1. Exposure to the weather during the part of the year when it is not in use. Iron implements, such as ploughs, suffer little in this respect, but machinery in which wood is largely used, and where the iron parts are of finer construction, deteriorates considerably.

2. Failure to keep all parts tightly screwed together, thus permitting breakages and rapid wearing.

3. Loss through neglect of lubrication.

The Value of—

HERD RECORDING IN THE MILK ZONE.

A DAIRYMAN'S EXPERIENCE.

I. W. SCOTT, H.D.A., H.D.D., Special Dairy Instructor.

MANY dairymen know the meaning of herd recording, but for the benefit of those who do not, it can be simply described as a system of accountancy for a dairy herd, whereby the weight of milk, the test and the butter-fat yield of each cow are recorded monthly, giving the owner, at the end of the year, a definite record of each cow's actual performance under his system of management.

By participation in the recording scheme, each cow can be compared for milk and fat production as well as for test percentage, in addition to length of lactation, persistency of milking and so on, and the yard stick can be put on the herd sire, which must be judged on the performance of his daughters.

Recording is carried on in two Divisions, viz.: Division 1 (for registered pure-bred cattle); and Division 2 (for commercial herds).

Many farmers ask—"What is the use of recording under existing conditions"? The answer is that recording is a long time project, and if dairy farming is worth carrying on at all, then recording of the producing units should be worth while.

In the Milk Zone, production recording has never reached the proportions obtained in the butter areas. Milk Zone dairymen have made quantity alone their aim—until their milk has been rejected at the factory as below fat standard. They will be interested in the experience of a dairyman in the Milk Zone whose results from herd recording proved its value to him, and showed that he had a good herd with which to start.

The Yields Over Three Years.

About three years ago this dairyman asked the Division of Dairying for advice on production recording. I visited him, and as a result he placed his herd under record. In that first month his thirty-two cows averaged 20 lb. of milk per day. During the next twelve months his daily average fell below 20 lb. of milk on three occasions —an event that has happened only once during the past two years. During the next twelve months his average production ranged from 22 to 36 lb. per cow per day, while this last year it has ranged from 18.7 to 42 lb.—the figures for the best four consecutive autumn months being 41, 42, 36 and 36 lb. per cow.

The Cows Were Fed According to Production.

"How can herd recording take the credit for this"? I can best reply to this question in the man's own words. On this point he said, "When I started recording and you talked about balanced rations and individual feeding according to milk weights, I thought you were talking a lot of 'white collar theory,' but I am satisfied now that you were right—you have made me feed conscious and have put me on the right track."

Prior to starting recording, this farmer fed all his cows the same amount of feed, both roughage and concentrates, without regard to balance of quantity or quality—8 lb. per head being the usual rate of concentrates per cow. When accurate milk weights became available, he fed the same amount of feed as before, but as a basal ration, and gave each cow extra concentrates at the rate of 4 lb. per gallon over a yield of 2 gallons, so that a cow giving 3 gallons received 12 lb. grain and a 4-gallon cow received 16 lb. of concentrates, this being the general limit set. In addition, he fed a properly balance grain ration, *i.e.*, a mixture of concentrates in which the protein or milk-producing substance was in correct proportion to the starch or energy-producing materials, as well as the protein being in a proportion adequately to balance the particular class of roughage. For example, when silage and cereal hay formed the roughage, the concentrate contained a higher propor-

tion of protein than when lucerne hay formed the bulk of the roughage.

As a result he found that yields were more consistently maintained at higher levels, with the cows also maintaining condition better.

When recording started, the best cow in the herd gave 44 lb. of milk per day. This dairyman has seen this ceiling go to 70 lb. per day with 3 lb. of butterfat per day for his best cow. He counts the small cost and trouble of recording once a month more than recompensed by the added interest he finds in the herd, in striving to beat previous figures, as well as from the actual cash improvement following the use of the figures he obtains each month.

Results in Milk Zone Terms.

Speaking in Milk Zone terms this farmer has seen his output rise from 6½ cans of milk per day from thirty-two cows to 14½ cans from thirty-five cows. He has seen his average of thirty-one cows completing a nine months' lactation record, rise from the remarkably good figure of 712 gallons per cow containing 283 lb. butterfat, to 814 gallons per cow with 312 lb. butterfat, with a rise in the average test from 3.7 to 3.9 per cent. He has seen his feed cost per cow rise from 1s. 9d. per cow to 2s. 8d. per cow and his return over feed cost per cow rise from 11d. to 3s. 2d.

Stock Positively Identified.

When recording started this farmer kept no definite breeding records and depended solely on memory to identify his young stock, but he was quick to see the importance of positive identification in a breeding plan embodying the use of high priced, production-backed sires with the rearing of replacements from the better breeding dams. Consequently he now identifies all heifer calves reared, by ear tattoo at birth, and with the parent stock similarly identified, he is the first farmer in New South Wales with a commercial grade herd eligible to have his calves tattooed in the ear with the hallmark indicating a calf of merit, *i.e.*, one whose sire is a registered animal, the dam of which has a production certificate. His pure-bred sire is also eligible for official sire survey, which will not, of course, make the sire or herd any better, but will, when all the daughters of the sire are recorded, furnish reliable breeding information on which to base future operations.

When asked if he thought herd recording in the Milk Zone paid, this dairyman replied, "I don't think, I know it does. Besides eliminating guessing, it has made me go to another State to get a bull with production backing. I don't know how other dairymen get on without it."

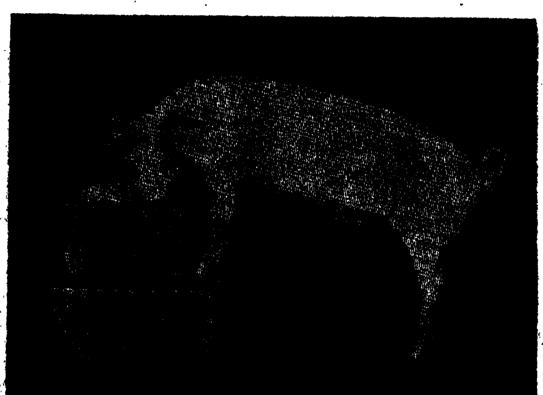
A Raised Drinking Trough for Pigs.

THE problem of keeping drinking water for pigs clean and unfouled is easily solved by raising the trough to a height of 20 or more inches, and having a platform half-way from ground level to the top of the trough.

The top of the trough in the accompanying illustration is 20 inches above floor level, and the platform 2½ inches wide. The actual drinking chamber is 9 inches by 9 inches, 8 inches deep.

The water is controlled by float from an outside chamber and enters the drinking trough from the bottom. A 2-inch drainage pipe is provided to ensure quick flushing out of pipes and troughs.

Troughs can be made any size desired, but large drinking chambers are not necessary when water is float controlled. Well-grown weaners can drink comfortably from a trough 20 inches high. For older animals such as baconers and breeding stock, somewhat higher troughs are advisable, say 2 feet to 2 feet 6 inches.



Raised Pig Drinking Trough with Platform.
[South Australian Dept. of Agriculture photo.


"farmers are good judges!"
FIREZONED
GALLONS

FEEDS AND FEEDING NOTES.

Contributed by The Division of Animal Industry.

GREEN FEED FOR POULTRY.

What is its Value? Is it Essential? Does it Pay?

A MAJOR activity on most poultry farms is growing, cutting, chaffing and distributing green feed? What is the value of this green feed? Is it essential in the ration? Does it pay?

The Value of Green Feed.

Green feed has a high content of water, so that about 4 lb. of it provides food matter equivalent to only 1 lb. of dry feed. Accordingly, feeding a mash of, say, 50 lb. of chaffed green feed, and 50 lb. of a mash such as bran, pollard, meatmeal and wheatmeal, is not the same as 100 lb. of mash; it is equivalent only to $50 + \frac{50}{4}$, that is about 62 lb. of mash.

It is an excellent source of carotene (vitamin A). One ounce of green feed per fowl per day provides adequate vitamin A for adults.

It is an excellent source of riboflavin, being nearly as rich as milk powder. However, even when fed to capacity, it will not always adequately supplement an otherwise riboflavin-deficient growing or breeding ration.

It is a good source of other vitamins which may, possibly, be deficient in certain rations.

If birds are given as much green feed as they will eat, they will take up to 2 ounces per head per day depending on their production rate. By giving chaffed green feed in the mash, birds can be made to eat more, and some saving of mash is probably obtained.

It has a relatively low energy value for poultry, owing to the high content (20 to 30 per cent.) of indigestible fibre.

The food value of green feed varies widely, because plants change in composition as they grow. Young, leafy, green feed cut well before flowering, has a a high content of protein, riboflavin, minerals and carotene, and is highly digestible. However, as it matures, that is flowers and seeds, the protein, vitamin and mineral contents quickly fall. For example, oats 8 inches high high might contain 20 per cent. of protein in the dry matter, but after flowering this may have fallen to about 8 per cent. Lucerne and clovers do not fall off in protein and vitamin content as quickly as grasses and cereals, so that flowering clovers and lucerne are quite good sources of protein and vitamins.

Is Green Feed Essential?

THE main function of green feed is to supply vitamin A and riboflavin for growing and breeding stock, and pigments for colouring the egg yolk. Is it essential in the ration? Can it be replaced by other feeds? Research indicates that it can be replaced.

In the United States of America fresh green is rarely fed, lucerne meals and fish oils being used instead. Lucerne meal contains the original vitamins and yolk colouring pigments in the green feed in amounts only slightly lower than in the fresh feed, except for carotene (vitamin A), which usually decreases to a variable extent; 10 per cent. of lucerne meal in the mash-grain ration or 5 per cent. in an all-mash is equivalent in everything except carotene (vitamin A) to about one ounce of green feed per adult bird per day. Vitamin A-rich fish oils, should be fed with lucerne meal which is not a very reliable source of vitamin A.

(Continued on page 613.)

The Future of the Poultry Industry in New South Wales.*

IN any attempt to forecast what the future holds for the poultry industry, there are several important factors to be taken into consideration. Of these the most momentous are feed supplies, export of eggs and greater development of the home market.

As far as feed supplies are concerned, it is apparent that during the next year the industry will largely be dependent upon obtaining wheat from other States, but if weather conditions are such as to ensure a good crop of grain sorghum in New South Wales the position will be relieved somewhat from about April next—and on the law of averages there should be a better wheat harvest the following season.

Whether supplies of poultry foodstuffs will be sufficient for all requirements during the next year will, to a large extent, be determined by the availability of transport to convey wheat from other States and will also be dependent on an increase in milling operations to provide larger supplies of mill offals. The transport problem is one which may cause some difficulty, as about 3,000 tons per week of grain alone are required to feed this State's poultry flocks, in addition to a similar quantity of mash feeds.

* Notes of a lecture given to the Hatcherymen's Association on 22nd October, 1946.

The Export of Eggs.

Although the British Ministry of Food has agreed to take from the Commonwealth up to one million cases of eggs and an equivalent amount of pulp this season and next, there is yet no indication as to the quantities which will be required after 1947, or the price which Britain is prepared to pay. Much will depend upon the decision in this regard, as a lower export price will have repercussions on the market here, unless local consumption can be increased to absorb a greater proportion of production.

It is only reasonable to assume, however, that owing to the world shortage of foodstuffs the poultry flocks in Britain and on the Continent will not be built up again to

POULTRY-FARMERS *are reminded that applications for pens in the 1947-48 Egg-laying Competition to commence at Hawkesbury Agricultural College, Richmond, on 1st April, 1947, will close on 11th December, 1946, by which date the application form showing particulars of stock owned at 1st December, 1946, must be in the hands of the Organising Secretary, Hawkesbury Agricultural College, Richmond, New South Wales.*

pre-war levels for a few years. Figures recently published concerning the poultry populations of Denmark and Holland, two of the main egg-producing countries exporting to Britain, show that flocks there are still far below the numbers prior to the war. Moreover, it must be borne in mind that as the winter period on the Continent is the same as in Britain it is unlikely that there will be any large surplus of fresh eggs available for export during the season of shortage in Britain. Most of the eggs shipped across the Channel at that time must be cold stored from the previous summer. It appears probable, therefore, as our seasons are opposite, that if we send good quality eggs, there should be a market in Britain for our surplus production for a number of years, but the time has arrived when we should have a market representative in London to look after our interests there and attend to any troubles on the spot. The cost of such a representative would only be a very small percentage of the total value of eggs exported.

Better Quality Eggs Essential.

To ensure a ready demand for our eggs in Britain, it is essential that the highest quality be maintained, and this is a matter which affects every producer. It is only by every poultry farmer doing his utmost to maintain the quality of the eggs produced that we can ensure a better product for export, but until some incentive, in the form of an increased price for eggs of export quality, is given, it is unlikely that the fullest co-operation of the producers will be obtained. It is not reasonable to expect that all farmers will go to the extra trouble and expense involved in keeping eggs clean and in every other phase of handling in order to pack a "super grade" for export, without being paid a higher price than for those eggs which can only be sold on the local market.

The relaxation of the grading regulations to permit of slightly soiled eggs being included in the export pack and the recent appeal to producers to avoid washing eggs should go a good way towards improving the keeping quality of eggs exported, but more effort is required to increase the proportion of exportable eggs.

In improving the quality of eggs for export the general quality of those sold on the local market should also be enhanced, thus assisting in creating a greater demand.

Handling Eggs from Farm to Consumer.

Although the farmer may do everything possible to ensure the production of high quality eggs, his efforts are in vain unless the product is handled carefully in transit and reaches the consumer without delay. In this connection, there is room for considerable improvement in the carriage of eggs in the summer. It cannot be expected that the highest quality will be maintained when lorry loads of eggs are allowed to stand uncovered in the intense heat, both on the roads and awaiting unloading. Moreover, the constant jolting along rough roads without any padding on the bottom of the lorry is not conducive to preserving the quality of the eggs.

In connection with expediting delivery to the consumer, some means must be devised to overcome the delay which frequently occurs during the flush season—when eggs deteriorate more rapidly. No doubt there will be improvement in this regard when the new Egg Board premises at Lidcombe are completed, but the extension of the "Farm pack" system and placing the responsibility on the farmer for maintaining a high standard of quality, appears to be one solution of the problem.

With improvement in quality, an active publicity campaign on the lines carried out by the Poultry and Egg National Board in America should increase local consumption of eggs and thus enable further expansion of the industry.

Handling Surplus Production.

It is inevitable that there will always be a surplus over immediate consumption requirements during the flush season, and the logical course, apart from export, is to cold store the maximum quantities for autumn and winter consumption. For this purpose increased storage and improved cold storage facilities to increase the period over which eggs can be held in storage without deterioration are necessary; also the provision of cool rooms at all large egg-handling depots to avoid loss of quality, particularly in the warm weather.

The problem of co-ordinating the handling of excess production in any State to avoid the breaking down of the local markets is one which remains to be solved, and the future stability of the industry throughout

Australia will be largely dependent upon the successful working of a scheme to accomplish this. To be satisfactory, however, the cost of handling the surplus must be strictly controlled, and to be of the maximum benefit to the industry the scheme should enable the maintenance of a home price based on the cost of production.

The fear has been expressed that higher returns to the producer would result in increased production; actually the reverse is more likely to be the case, because when returns are low it is necessary for most farmers to increase the numbers of stock to make a living, and this results in a greater increase in production than would result from the few additional newcomers who might be attracted to the industry on account of improved returns.

Control of Production.

It has been suggested that the licensing of farms and control of flocks would be the best means of ensuring payable returns, but the advocates of such a scheme apparently do not visualize the difficulties of enforcing restriction of flocks or the repercussions which would be likely to result. In the first place it would be necessary to have a Commonwealth-wide scheme, otherwise a State adopting restriction would provide a market for those which had no control. Moreover, it would be possible for farmers with large flocks to increase by several hundreds at any time without much fear of detection, as it would require a large staff of inspectors to check up on the numbers.

Again it would be necessary to limit the number of producers coming into the industry and this would raise problems in connection with ex-servicemen and civilians who, for health reasons, desired to take up poultry farming either as a sole means of support or to augment a small income or pension, and the claims of these people could hardly be ignored.

Taking all aspects into consideration, the industry would be well advised not to seek regimentation, especially by means of a scheme which may not achieve the desired result.

Influence of Hatcheries on the Future of the Industry.

More than ever before in the history of commercial poultry farming does the hatcheryman play a part in shaping the future of the industry. The fact that a large proportion of poultry farmers now purchase day-old or started chicks for the maintenance of their flocks places a heavy responsibility on those who supply them, to ensure that the birds from which the chickens are produced are of the highest quality possible as regards health, physique and productivity.

When it is considered how much care and skill are necessary to maintain flocks of a high standard, it will be realised how far short of a desirable standard are many of the birds used for the production of chickens for sale. It cannot be expected that birds lacking in physique, character or production pedigrees will produce pullets which will show a profit to the purchaser.

With a view to providing an opportunity for careful breeders to become accredited, the Department has under consideration a voluntary scheme for official supervision of stud breeding farms and hatcheries, the details of which will be published when ready. In addition, conditions are being prepared for a voluntary scheme for listing Pullorum-free flocks.

It is expected that most of the prominent hatcherymen will come into the schemes and by doing so will enhance their status as breeders.

An outline of the proposed scheme for accrediting breeding farms and hatcheries was published recently in the poultry press, but briefly the requirements would be:—

(1) Flocks to be free of Pullorum disease.

(2) Breeding stock to be of a reasonable standard in respect of weight and breed character, and be identified by sealed leg band.

(3) Premises to be kept in a reasonably sanitary condition.

(4) Eggs for hatching to be of a minimum size and normal shape, etc.

(5) Purchase of eggs for hatching to be restricted to farms complying with the conditions laid down.

(6) Advertising to be subject to approval.

Detailed rules covering these points would be drawn up for observance by those joining the scheme.

Feeding Notes—*continued from page 609.*

Even the lucerne meal is not essential with laying stock. Birds have been carried throughout the year on a ration containing no green feed or lucerne meal, with only fish oils to supply vitamin A, and have maintained egg production equal to birds on green feed and showed no difference in health. Of course, the yolks would be very pale on such a ration unless yellow maize were included.

Cost is the Determining Factor.

The decision as to whether green feed, or fish oils with or without lucerne meal is to be fed is largely made on costs. Does the cost of ploughing, fertilizer, seed, cutting, carting, chaffing and daily distribution of green feed exceed the cost of the fish oil plus the lucerne meal? If the green feed is cheaper and the labour is available for the daily distribution, then it is probably best to continue it. If the fish oil, plus lucerne meal is cheaper, there is no disadvantage in discontinuing the green feed.

The amounts of fish oil to add to rations were discussed in the October, 1945 issue of the *Gazette*.

Common Causes of Colic in Horses.

THE commonest causes of colic in horses are errors in the quantities of food given and the size of the feeds. Sudden changes of food (particularly that from grass to grain), heavy feeding immediately before hard work, the bolting of quantities of indigestible grain, such as wheat, and the ingestion of large quantities of fibrous matter, such as the running stems of the paddymelon (*Cucumis myriocarpus*)—all these are liable to cause colic in strong, well-conditioned horses. There are also other causes likely to operate in animals debilitated through a continuous low ration or temporarily exhausted from excessive strain. The administration of even an ordinary grain feed will, at times, cause trouble in these cases, and the giving of an extra large feed to a tired or exhausted animal may lead to serious results.

In cases of debility the tone of the digestive organs is so low that large quantities of concentrated food cannot be dealt with, and indigestion and colic result. Debilitated animals are also peculiarly prone to flatulent colic if food of a highly succulent and fermentative nature is given. Weak and exhausted animals should, above all others, receive small feeds at comparatively short intervals. They should also be worked with care, as it is in animals in that condition that colic is especially apt to be associated with watering. On the other hand, the danger of giving water to a warm horse has been much over-estimated.

In many cases where improper feeding may not lead to attacks of colic it will induce a more or less serious indigestion—at times acute, and at others chronic—and a consequent unthriftiness. In such cases the first step should be to investigate the methods and materials used in feeding and to correct any errors noted. This should always be done before resort is made to medicine, which will in many cases be then found unnecessary.

Tubercle-free Herds.

THE following herds have been declared free of tuberculosis in accordance with the requirements of the scheme of certifying herds tubercle-free, and, unless otherwise declared, this certification remains in force until the date shown in respect of each herd :—

Owner and Address.	Number Tested.	Expiry Date.
Registered Stud Herds.		
Armstrong, K. A., "Heathfield," Boorowa ...	23	18/12/46
Bathurst Experiment Farm (Guernseys) ...	28	12/10/46
Berry Training Farm, Berry (A.I.S.)	129	16/10/46
Bradley, H. F., "Nardoo," Ashford Road, Inverell (Jerseys)	40	13/4/47
Campbell, L. W., "Dunmallard," Fern Hill Road, Inverell (Jerseys)	39	21/7/47
Cattell, E. J., "Kapunda," Rob Roy, Inverell (Jerseys)	121	30/6/47
Chegwidden, E., "Austral Park," Berry (Jerseys)	88	14/1/47
Christian Bros. Novitiate, Mt. St. Joseph, Minto	29	15/7/47
Coote, B. N., Auburn Vale Road, Inverell (Jerseys)	85	23/7/47
Cowra Experiment Farm (Ayrshires)... ...	56	5/7/47
Department of Education, Yanco Agricultural High School (Jerseys)	64	1/3/47
Dixon, R. C., Elwatan, Castle Hill (Jerseys)...	29	5/3/47
Fairbairn, C. P., Woomargama	173	17/3/48
Farm Home for Boys, Mittagong (A.I.S.) ...	59	2/8/48
Farrer Memorial Agricultural High School, Nemingah (A.I.S.)	44	28/8/47
Forster, N. L., Abington, Armidale (Aberdeen-Angus)	167	24/5/48
Frater, A. D., King's Plain Road, Inverell (Guernseys)	107	11/4/47
Freudenstein, W. G. A. & F. J., "Chippendale," Grenfell Road, Young (Beef Shorthorns)	49	15/1/47
Hann, O., Bomerah, Barrington	55	8/8/47
Hawkesbury Agricultural College, Richmond (Jerseys)	119	19/3/47
Hurlstone Agricultural High School, Glenfield (Ayrcshires)	53	12/8/48
Kahlua Pastoral Co., "Kahlua," Coolac (Aberdeen-Angus)	257	30/11/47
Killen, E. L. "Pine Park," Mumbil (Beef Shorthorns)	261	25/9/46
Knight, G., Tannabah, Coonabarabran ...	60	30/11/46
Lidcombe State Hospital and Home (Friesian)	111	3/10/46
Limond Bros., Morisset (Ayrshires)	64	26/4/47
McGarvie Smith Animal Husbandry Farm, Liverpool (Jerseys)	72	22/2/47
Martin, W. W., "Narooma," Urana Road, Wagga (Jerseys)	127	14/9/48
Navua Stud Farm, Grose Wold, via Richmond (Jerseys)	120	8/10/47
New England Experiment Farm, Glen Innes (Jerseys)	46	18/3/47
Newman, G. H., "Bunnigalore," Belanglo (Jerseys)	38	2/12/46
Peel River Land and Mineral Co., Tamworth (Poll Shorthorns)	110	16/10/46
Raper, W. R., Calool, Culcairn (Beef Shorthorns)	86	12/2/47
Reid, D. B., "Evandale," Sutton Forest (Aberdeen-Angus)	61	23/11/47
Riverina Welfare Farm, Yanco (Jerseys) ...	130	26/6/46
Scott, A. W., "Milong," Young (Aberdeen-Angus)	114	11/6/46
Simpson, F. S., "Gunnawarra," Gulargambone (Beef Shorthorns)	167	19/11/47
Trangie Experiment Farm, Trangie (Aberdeen-Angus)	155	11/3/47
Wagga Experiment Farm (Jerseys)	15	1/2/47
Wallaga Lake Aboriginal Station	19	29/4/47
White, H. F. Bald Blair, Guyra (Aberdeen-Angus	300	20/4/47
Wollongbar Experiment Farm (Guernseys) ...	110	16/3/47
Young, A., "Daylesford," Cudal (Beef Shorthorns)	23	25/2/47

Owner and Address.	Number Tested.	Expiry Date.
Herds Other than Registered Stud Herds.		
114 A.G.H., Kenmore	48	26/6/46
Aboriginal Station, Brewarrina	14	20/5/46
Aboriginal Station, Wallaga Lake	19	29/2/46
Australian Missionary College, Cooranbong ...	100	30/8/47
Barnardo Farm School, Mowbray Park ...	53	18/7/47
Brookfield Afforestation Camp, Mannus ...	197	12/7/47
Cameron, N., Montrose, Armidale (late New England Girls School)	33	20/2/47
De Fraine, A. N., Reservoir Hill, Inverell ...	21	8/6/47
Department of Education, Gosford Farm Home	37	26/2/47
Ehsman Bros., Inverell	39	29/8/48
Emu Plains Prison Farm	115	29/1/47
Fairbridge Farm School, Molong	25	9/7/47
Forster, N.L., and Sons, "Abington," Armidale	62	24/5/48
Foy, F. J., The Valley Farm, Megalong Valley	25	18/12/47
Frizelle, W. J., Rosenstein Dairy, Inverell ...	134	16/8/47
Goulburn District Hospital	5	6/11/46
Goulburn Reformatory, Goulburn	7	27/6/47
Grant, W. S., "Monkittee," Braidwood ...	23	29/4/47
Hannaford, A., Braidwood	10	1/2/47
Harcombe, F. C., Hillcrest Farm, Warialda Road, Inverell	53	10/4/47
Hunt, F. W., Spencers Gully	27	16/2/47
Koyong School, Moss Vale	2	5/3/47
Lott, J. H., "Bellevue," Rob Roy, Inverell...	41	26/6/47
Lunacy Department, Callan Park Mental Hospital	43	4/4/47
Lunacy Department, Gladesville Mental Hospital	20	15/4/46
Lunacy Department, Morisset Mental Hospital	79	8/3/47
Lunacy Department, Parramatta Mental Hospital	62	26/7/47
Lunacy Department, Rydalmere Mental Hospital	57	30/10/46
McGufficke, J. O., "Lovely Bank," Rob Roy, Inverell	33	25/6/47
McLane, R. G. P., Ibis Valley, Swanbrook ...	24	23/5/47
Morris, S. W., "Dunreath," Swanbrook Rd., Inverell	51	23/5/48
Murray, J. A., "The Willows," Keiraville ...	21	8/8/46
New England University College, Armidale ...	19	1/5/47
Orange Mental Hospital	63	19/3/47
Parker Bros., Hampton Court Dairy, Inverell	125	25/8/47
Peat and Milson Islands Mental Hospital ...	24	2/9/47
Reid, G. T., "Narrengullen," Yass	167	14/7/46
Richardson, C. E. D., Kayuga Road, Muswellbrook	78	3/7/47
Rolfe, V. J., "Mount View," Inverell ...	18	9/2/47
St. Ignatius' College, Riverview	24	7/7/47
St. John's College, Armidale	11	20/2/47
St. Joseph's Orphanage, Kendall Grange, Lake Macquarie	9	11/6/47
St. Michael's Orphanage, Baulkham Hills ...	40	4/6/47
St. Patrick's Orphanage, Armidale	10	15/11/46
St. Vincent's Boys' Home, Westmead ...	33	9/7/48
State Penitentiary, Long Bay	13	30/11/47
Stephenson, W. J., "Hill View," Fig Tree ...	53	1/2/47
The Sydney Church of England Grammar School, Moss Vale	48	18/12/47
Turnbull, J. M., "Pastime," Kayuga Road, Muswellbrook	85	20/3/47
Weidman, A. B., No. 2 Dairy, Aberdeen Road, Muswellbrook	68	3/9/46
Weidman, A. B., No. 3 Dairy, Kayuga Road, Muswellbrook	38	6/9/46
Weidman, A. B., No. 4 Dairy, Kayuga Road, Muswellbrook	57	2/11/46
William Thompson Masonic School, Baulkham Hills	54	10/6/47
Wilson, A. G., "Blytheswood," Exeter ...	66	23/4/47
Wilton, C., Bligh Street, Muswellbrook ...	54	12/5/46
Youth Welfare Association of Australia ...	162	26/4/47

Tubercle-free Herds—*continued.*

Tubercle-free Areas.

THE following Areas have been declared tubercle-free and no cattle are allowed to be kept therein unless subjected to the tuberculin test and found free from tuberculosis :—

Bombala Area.
Inverell Area.
Braidwood Area.
Municipality of Muswellbrook.
Municipality of Queanbeyan.

MAX HENRY, Chief Division of Animal Industry.

Herd-Recording Movement Makes Good Progress.

THE herd recording movement continues to gain favour, and many new members have been signed up for the new recording year which commenced in October.

By continuously recording his herd, and using the information gained on milk and fat yields as a basis for individual or group feeding of his cows, a farmer is in a position to place his feeding programme on an economic level. This benefit of recording can be put into practice immediately the first records are available, and the records which are thus built up month by month provide the foundation for the breeding programme.

Inquiries concerning herd recording should be addressed to the Division of Dairying, Department of Agriculture, Box 36A, G.P.O., Sydney.

Blending of Cream on the Farm.

IT is the practice with very many farmers to keep the cream obtained from each separation in different utensils, and only mix these together just prior to sending to the factory. In this way, the first separation, which has been kept by itself, often becomes stale and over-ripe, and each of the subsequent lots is similarly affected, though to different degrees, according to the length of time it is held after separating. When these lots, consisting sometimes of from four to six separations, as the case may be, are bulked together, some of the blend is almost sure to be of at least doubtful quality.

The way to overcome this trouble is by blending the various separations immediately they have been cooled down sufficiently. An examination of cream on the grading floor of almost any factory will indicate that there is great need among farmers for the use of more modern methods in the keeping of their cream, and the proper blending of the cream after separation is one of the most important operations.

The process of cream souring, or in other words ripening, is vitally necessary in butter-making for the development of the delicate butter flavours. The farmer's job is to do all in his power to see that this ripening takes place in a normal manner. He cannot prevent the entry of the milk-souring bacteria responsible for the souring of the cream, but he can control their abnormal multiplication and thereby prevent faults known as staleness and over-ripeness, which in their turn lead to the development of the off-flavours, possibly terminating in rancidity.

There are a number of ways by which the farmer may protect his cream from becoming over-ripe, or, as it is technically described, from having high acidity:—

1. Keeping the cream as cool as possible.

2. Thorough cleansing and final sterilising of utensils with boiling water.

3. Separating at the correct fat percentage.

4. Last, but by no means least, is the important item of correctly blending the various separations with each other while holding them at the farm and before despatch to the factory.

Care of the Separators.

THE operation of the separator and the care devited to its cleansing have a material effect on the quality of cream produced. On no account should the separator be left overnight without being dismantled, and all parts thoroughly cleansed and scalded. After separating, all utensils and separator parts with which milk has come in contact, including the vats, buckets, and strainer, should be washed with slightly warmed water and then submerged in boiling water and placed on racks to drain. The practice of wiping over the utensils with a cloth after scalding only serves to undo the work of sterilisation and to re-infect with bacterial organisms.

Milk should not be left lying about on the floor or under the separator block, and the surroundings should be kept sweet and clean, and the drains free to carry away the floor washings.

Brucellosis-free Herd Scheme (Swine).

THE following is a list of the names and addresses of owners of herds which have been declared brucellosis-free in accordance with the requirements of the Brucellosis-free Herd Scheme (Swine). The work in connection with this scheme has been undertaken as part of the general campaign against this disease and should perform a valuable service to the industry generally. Owing to the limitations of staff it will not be possible for the Department to undertake the testing of herds in general for this purpose, and in future only herds belonging to Government institutions, registered stud herds, or those containing a preponderance of registered stud animals, will be accepted for inclusion in the list. A charge will be made for the work, since the inclusion of a herd in this list should be of benefit to the owner. After a herd has been accredited, two semi-annual tests will be required, and thereafter annual tests, provided that the conditions outlined in the agreement form are strictly adhered to and that negative results are obtained at each test. So far as the elimination of the disease is concerned, apart from placing the herd on the accredited list, this work will continue as at present.

Registered Stud Herds.

Bathurst Experiment Farm, Bathurst.
Boardman, C. M., " Fairview," Camden.
Campbell, D., " Hillangrove," Wamberal, via Gosford.
Cocks, F. D., " Condalarra," Miranda.
Cowra Experiment Farm, Cowra.
Croft, F., Lugwardine, Kentucky.
Draper, R. E., " Glengar," Capertee.
Foley, J. B., Gundurimba Road, Loftville, via Lismore
Garrison Battalion (2nd), Manly.
Gladesville Mental Hospital.
Government Agricultural Training Farm, Scheyville.
Grafton Experiment Farm, Grafton.
Harris, K. H., Pennant Stud Piggery, Purchase Road, West Pennant Hills.
Hawkesbury Agricultural College, Richmond.
Holland, A. L., Argonne, Tubbul.
Hurlstone Agricultural High School, Glenfield.
Maybin, N. C., Towac, Orange.
New England Experiment Farm, Glen Innes.
Newington State Hospital and Home, Newington.
Ricketts, C. C., " Mangus," Young.
Riverina Welfare Farm, Yanco.
Rydalmere Mental Hospital.
Shirley, G. F., " Camelot," Penrith.
Upston, H. E., Wattle Tree Road, Holgate, via Gosford.
Wagga Experiment Farm, Wagga.
Waterfall Sanatorium, Waterfall.
White, A. N., Blakeney Stud, Orange.
Williams, G. R. B., " Gwandalan," Grenfell.
Wollongbar Experiment Farm, Wollongbar.
Yanco Agricultural High School.

Herds Other than Registered Stud Herds.

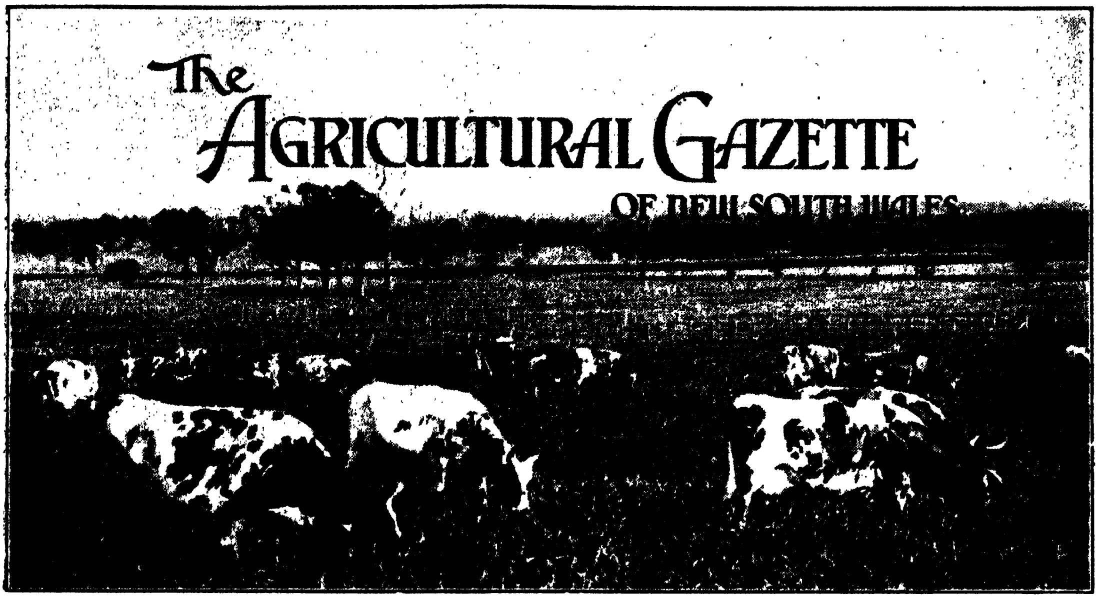
114 A.G.H., Kenmore.
Bathurst Gaol, Bathurst.
Brookfield Afforestation Camp, Mannus.
Callan Park Mental Hospital, Callan Park, Rozelle.
Emu Plains Prison Farm.
Glen Innes Prison Camp, Glen Innes.
Gosford Farm Home for Boys, Gosford.
Goulburn Reformatory, Goulburn.
Higgins, J. P., " Koranga," Camden.
Lidcombe State Hospital.
Morisset Mental Hospital, Morisset.
Orange Mental Hospital.
Parramatta Gaol, Parramatta.
Parramatta Mental Hospital.
Peat and Milson Islands Mental Hospital, Hawkesbury River.
Stockton Mental Hospital.

Abortion-free Herds.

THE following herds have been declared free of contagious abortion (Bang's disease) in accordance with the requirements of the scheme of certifying herds abortion-free :—

Owner and Address.	Number in herd.
Registered Stud Herds.	
Armstrong, K. A., " Heathfield," Boorowa ...	23
Bathurst Experiment Farm (Guernseys) ...	28
Cowra Experiment Farm (Ayrshires)	55
Department of Education—Farm Home for Boys, Mittagong (A.I.S.) ...	51
Dixson, R. C., " Elwatan," Castle Hill (Jerseys) ..	22
Fairbairn & Co., C. P., Woomargama (Beef Shorthorns)	173
Farrer Memorial Agricultural High School, Nemingha (A.I.S.)	44
Forster, N. L., Abington, Armidale (Aberdeen-Angus)...	167
Hann, O., " Bomerah," Barrington (Jerseys)	42
Hawkesbury Agricultural College, Richmond (Jerseys)...	96
Hicks Bros., " Meryla," Culcairn	65
Hill, E. Pritchard, Bowling Alley Pt. (Jerseys) ...	96
Hurlstone Agricultural High School, Glenfield (Ayrshires)	53
Killen, E. L., Pine Park, Mumbil	141
McEachern, H., Tarcutta (Red Poll)	61
McSweeney, W. J., " The Rivers," Canowindra (Beef Shorthorns)	95
Martin Bros., " Narooma," Urana-road, Wagga (Jerseys)	160
Navua Stud Farm, Grose Wold, via Richmond (Jerseys)	101
New England Experiment Farm, Glen Innes (Jerseys)...	46
Peel River Land & Mineral Co., Tamworth (Beef Shorthorns)	100
Raper, F. S., Calool, Culcairn	80
Reid, G. T., " Narengullen," Yass (Aberdeen-Angus) ...	276
Riverina Welfare Farm, Yanco	135
Scott, A. W., " Milong," Young (Aberdeen-Angus) ...	474
Simpson, F. S., " Gunnawarra," Gulargambone (Beef Shorthorns)	150
Training Farm, Berry	118
Trangie Experiment Farm, Trangie (Aberdeen-Angus)...	155
Wagga Experiment Farm, Wagga (Jerseys)	47
Walker, Jas. R., " Strathdoon," Wolseley Park (Red Polls)	37
White, F. J., and Sons, Bald Blair, Guyra (Aberdeen-Angus)	152
Whitelaw, L. A., " Wendouree," Merriwa (Beef Shorthorns)	79
Wollongbar Experiment Farm (Guernseys)	110
Young, A., " Rocklynne," Cudal (Polled Beef Shorthorns)	27
Herds Other than Registered Stud Herds.	
114 A.G.H., Kenmore	66
Callan Park Mental Hospital	45
Department of Education—Farm Home for Boys, Gosford	34
Fairbridge Farm School, Molong	42
Forster, N. L., and Sons, " Abington," Armidale ...	62
Morisset Mental Hospital	66
New England University College, Armidale	20
Orange Mental Hospital	61
Peat & Milson Islands Mental Hospital	84
Royal Prince Alfred Hospital, Camperdown, " Yaralla " Herd	94
Rydalmere Mental Hospital, Rydalmere	57
Salway, A. E., Cobargo	62

MAX HENRY, Chief of Division of Animal Industry.



Editorial—

Water.

Production's Limiting Factor.

WATER is the limiting factor in production. Recurring calamitous droughts have not succeeded, so it would seem, in impressing upon all, except for the time being, the really vital necessity of an assured water supply on every farm—water for stock, crops, pastures and the household.

Of the total rain which falls on a farm it would be interesting (perhaps astonishing) to know what proportion is allowed to run to waste in creeks and rivers. Even when drought has reduced pasture land to dusty, feed-bare paddocks, creeks and rivers can still be found running precious water past, often through, parched areas.

Particularly is this true of our coastal areas. In many respects the notion that our coastal belt is richly fertile and well watered is a delusion. Mostly the soil is very fertile—equal to the best in the world—but fertility means nought in the absence of water. There often is a scarcity of water (rain) on the coast.

The number of farmers who have attempted to conserve water or to make use of available water is unbelievably small. So small that an irrigated farm in any district is still an object of unusual interest.

Last month a field day organised by the Agricultural Bureau and co-operating organisations, held on Mr. Mark Goldstein's irrigated dairy farm at Gleniffer (in the Bellinger Valley), drew a gathering of about 600 people.

Those farmers and their families came from nearby centres. They came to assess, it is suggested, the relative merits of depending on nature to supply water and of pumping it from a stream on the property (as Mr. Goldstein is doing) and applying it to pastures and crops—when intelligent decision decides that pastures and crops require it.

The merits of "man-controlled rainfall" (irrigation) were patent to all, and substantially backed by the owner's production returns.

On this 280-acre dairy farm there are 200 acres of hilly country and 80 acres of flat-land pastures spray-irrigated from a small stream. Crops of maize and lucerne are grown on second-class hilly land and better-class soil on the flats given over to improved irrigated pastures. Other factors contributing to Mr. Goldstein's success include sub-division into small paddocks (about six acres each) for rotational grazing, renovation and sowing of pastures (red and white clovers,

Italian and perennial rye and Phalaris), liberal applications of superphosphate and lime—but above all *water.*

This farm carries about 140 head of cattle (mostly pure-bred Jerseys) and over 130 pigs. Production last year was over 19,000 lb. commercial butter, in addition to between £400 and £500 from pigs.

"Raining" with Temperature over 100°.

Movable spray irrigation line on pastures on Mr. Goldstein's dairy farm, "Goldbrae," Gleniffer.

A hot, dusty, westerly gale was blowing this day. Temperature was well over 100°, but so far as these pastures were concerned it was "raining."

Agricultural Bureau Field Day at Gleniffer.

Some of the field-day gathering of 600 running a critical eye over Mr. Goldstein's pumping plant and spray line.

With 12 chains of movable pipe line half an acre can be watered at a time at the rate of one inch an hour.

They are the direct returns. Add indirect, yet very real, returns by way of improved soil fertility and consequent enhanced asset value of the farm, insurance against stock losses and slowed-up breeding, increased resistance to disease, surety of a stabilised income so essential to future planning of farm operations, and practically all chance (the big cause of drudgery) is removed from farming—by water conservation and irrigation.

It would almost seem that the farmer who aims to be progressive—the adopter of improved pastures, improved herds and the like—is adding still further to the gamble unless he conserves and uses water in conjunction with his other advanced methods, for experience surely has taught us that the adverse effects of droughty conditions are most marked on improved pastures and high producing animals. That same experience has also taught us that there is no such thing (except perhaps in a land salesman's advertisement) as an assured rainfall.

AGRICULTURAL BUREAU FIELD DAY AT GLENIFFER, NEAR BELLINGEN.

A Talk in the Cowyard.

Mr. George McGillivray, Chief of the Department of Agriculture's Division of Dairying, discusses points of a dairy cow with dairy farmers. Picture shows some of the 600 who attended a field day held on Mr. Mark Goldstein's farm, "Goldbrae," Gleniffer, last month.

Junior Farmers Run Critical Eyes and Hands Over Jerseys.

Local Junior Farmer Clubs co-operated to make the field day a success. They competed in pig and dairy cattle judging competitions. Experts from the Department of Agriculture adjudicated.

BRACKEN FERN POISONING IN CATTLE.

J. T. HAYSTON, B.V.Sc., Pastures Protection Bcards' Veterinary Research Officer.

BRACKEN fern plant (*Pteridium aquilinum*) is toxic for cattle, probably throughout the whole stage of its growth. The toxic principle has never been isolated, but its effects are unfortunately well-known on many coastal properties where bracken fern has grown unchecked during the war and has been allowed to invade pasture land.

On many properties, particularly on the slopes of hills or on the banks of creeks where cultivation is difficult, bracken fern will be found growing in profusion. Wherever cattle have access to the fern there exists the threat of deaths from bracken poisoning, particularly when the pasture is very short and feed supplies are scanty.

Symptoms.

A very important feature of bracken fern poisoning is the suddenness with which animals become sick. Although they may have been grazing on a bracken-infested pasture for some weeks and not shown any ill-health, without any previous warning one or more of the cattle may be found ill, showing symptoms which may lead owners to suspect that the animals are suffering from an infectious disease. Cattle may be in good condition but when they become sick they rapidly lose condition, lose their appetite and show general debility. They become "dopey," show a staggering gait when forced to move.

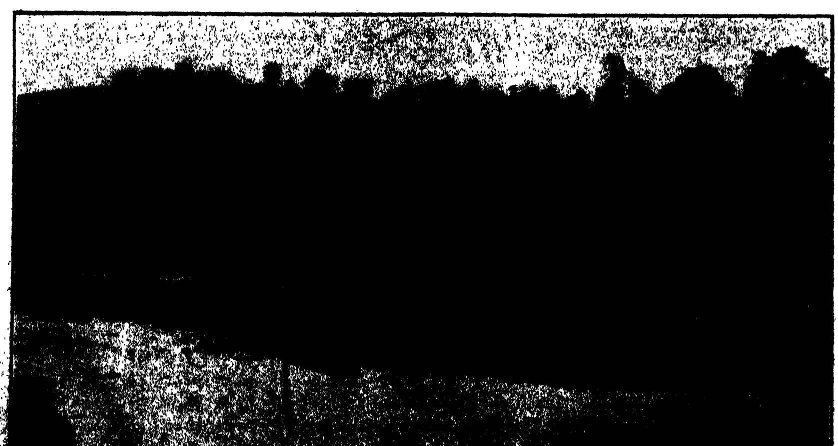
Affected animals show a high temperature (104 to 107 deg. Fah.). Certain cattle may pass clots of blood in their excreta, and their hocks and tails may be stained with blood. Some cattle bleed from the nostrils, some show excessive salivation and others show a shortness of breath resembling that of animals suffering from pneumonia. Affected cattle linger for several days and then die.

Post Mortem Findings.

The characteristic finding on post mortem examination of bracken poisoned animals is numerous haemorrhages throughout the body. These haemorrhages, varying from pin-head size to 3-inch squares, may occur beneath the skin, in the muscles, in the mucous surfaces or beneath the linings of the thorax or abdomen.

Within the chest cavity the changes in the lung may vary from an intense congestion to extensive pleuro-pneumonia leading to adhesions between the lung and the chest wall or the diaphragm. Haemorrhages are usually present on the heart.

Haemorrhages are present throughout the intestinal tract, and in places these haemorrhages have broken through the mucous membranes to form bleeding ulcers;



Typical Bracken Fern Infestation on Coastal Pasture Land.

from these ulcers blood escapes to appear as clots in the faeces. Ulcers will also be seen in the rumen and abomasum, and in some places these ulcers, with their sharply demarcated edges, are so deep as to be almost perforations of the gastro-intestinal tract.

Experimental Work.

Poisoning can be produced experimentally by prolonged feeding of cattle with bracken fern. In experiments carried out at Glenfield Veterinary Research Station, calves died in five weeks when they were fed daily about 4 lb. of fern fronds mixed with other food. During the first four weeks the calves showed no ill-effects, and then suddenly they showed symptoms of severe illness which rapidly advanced to a fatal termination. These feeding experiments show that the poisonous principle is probably present in the fern in only very small quantities, and that the poison is cumulative. The suddenness with which symptoms are shown is most surprising and is a characteristic feature of the disease.

Treatment and Control.

Once an animal has exhibited symptoms of bracken poisoning, little can be done to treat that beast successfully; the toxin has already produced its effects on the body. Although a number of therapeutic agents have been tried in the field, none of them has had any control over the course of the disease. If moved from access to the bracken as soon as symptoms are observed it is possible that a few affected animals may recover.

Observations in areas where bracken fern is common show that individual cattle vary in susceptibility. Some cattle appear to be highly resistant and show no signs of ill-health although other animals kept in the same paddocks die of the disease.

Where animals have had the opportunity of grazing on bracken-infested areas, the possibility of the occurrence of bracken fern poisoning must be borne in mind, and should a death occur from this cause, the animals grazing on the bracken should be immediately moved to a fern-free pasture.

Treatment of "Pink-Eye" in Sheep.

WITH the advent of warm weather, and increased trouble from flies and grass seed, "pink-eye" (contagious ophthalmia) in sheep tends to become a problem.

The majority of sheep readily recover without treatment, and as treatment of unaffected sheep during an outbreak does not protect them from infection, only those sheep which show advanced eye changes should be treated.

These may be drafted off from the flock, or collected as they separate themselves from the other animals, and placed in a "hospital" paddock, which should be conveniently situated so that frequent treatments may be made. If not separated from the flock in this way, some may be lost following attacks by crows. Ready access to the shearing shed is an advantage, in that it gives access to heavy shade. where adequate water can be supplied and hand-feeding can be resorted to quite readily.

All that is necessary in the way of equipment for carrying out treatment are an eye dropper, or as a substitute, an oil can fitted with valve rubber over the spout to prevent injury to the eye, and a pair of blunt forceps for removing grass-seeds and other foreign bodies from the eyes before treatment. Particular care should be taken to sterilise these instruments before use, and to use solutions prepared from boiled water, so that no infection will be introduced during treatment. Before carrying out the actual treatment, the wool should, if necessary, be removed from around the eyes, and grass-seeds and other foreign matter should be removed.

In applying treatment, the eyelids should be forced apart, using thumb and index finger, while several drops of the liquid are instilled beneath the lids. Irrespective of the drug used, treatment should, if possible, be made daily.

Probably the most suitable drug is a five per cent. solution of zinc sulphate (1 oz. zinc sulphate in 1 pint of water).

For fuller information on this disease, including alternative treatments, sheepowners are referred to the pamphlet ("Contagious Ophthalmia of Sheep") from which the foregoing paragraphs are taken. It is obtainable free on application to the Division of Information and Extension Services, Department of Agriculture, Box 36A, G.P.O., Sydney.

The Value of . . . .

GOVERNMENT EXPERIMENT FARMS TO THE FARMER.

Achievements in Better Crops, Stock and Practices.

A. W. S. MOODIE, H.D.A., Chief, Division of Plant Industry.

MANY farmers are but dimly aware of the existence of the Experiment Farms maintained for their benefit by the Department of Agriculture. Few, probably, fully appreciate the degree in which they were indebted to the various activities carried out on the Experiment Farms, and there are still those who are critical on the ground that the Farms do not "pay"—a criticism valid only in the narrowest meaning of the word.

Their function is not to make an annual profit for the Department, but to explore the manifold problems of the farmer, and, by experiment and research, make available to him ways and means of carrying on his calling to maximum advantage.

Wheat and Oat Improvement Work.

Some of these Farms have been responsible for the breeding of outstanding varieties of wheat (such as Waratah, Koala and Yalta) and oats (such as Belar and Fulghum)—a fact often overlooked by growers dependent for their livelihood on the disease resistance and productivity of these improved varieties. Indeed, it is no exaggeration to say that without the cereal improvement work of these Farms it is doubtful if wheatgrowing could be continued in some areas because of the liability to disease of the older varieties.

The last twenty years has witnessed a great expansion in the area sown to oats in the drier districts of New South Wales. This was made possible through the work of Pridham in breeding dry weather resisting varieties (such as Mulga and Gidgee) on various Experiment Farms. When one considers the many uses of oats on the farm, it is impossible to assess the value of this work in pounds, shillings and pence.

Lucerne Growing in Wheat Areas.

Another valuable achievement in the crop production field was the evolution of a technique for growing grazing lucerne under dry conditions. Many efforts to use lucerne in dry districts had been made, with but few successes. On Experiment Farms it was

One of the Blocks of the Quarters at Wagga Experiment Farm.

found that the vigorous plants following exceptionally light seedings were not only resistant to drought conditions, but they withstood heavy grazing. The result of this discovery was a boom in lucerne growing in the wheat districts, and a valuable addition to the few crops available to grow in rotation with wheat.

Pasture Improvement Practices.

Pasture improvement has made giant strides of recent years. How did we build up the fund of information so necessary to advise farmers about the correct grasses and clovers to sow, the best strains to use, and the correct fertiliser practices? Largely by investigational work on Experiment Farms. Australian conditions of soil and climate are so different to those overseas that our knowledge had to be built up gradually by experiments, and by trial and error. The values of strains of pasture plants now popular with graziers, such as Akaroa cocksfoot and certified perennial rye grass, were only assessed after testing thousands of different strains. Such work can only be carried out on Experiment Farms by trained workers.

Other important work includes soil fertility studies, diversified farming methods, the production of pedigree seed, and farm management methods.

Valuable Sources of Stud Stock.

Stockraisers find Experiment Farms a valuable source of stud animals at reasonable prices. The high production of many a dairy herd may be traced to a good bull secured in this way, and the influence of Experiment Farm sheep, pigs and poultry can be seen in every district.

Research work on the health and feeding of livestock is a prominent feature of Experiment Farm work which has far-reaching results, the importance of which is sometimes overlooked.

Plant Breeder's Oat Plots at Cowra Experiment Farm.

Educational Activities.

In the sphere of agricultural education, the Experiment Farm has always been prominent. Ex-students of Farms such as Wagga are to be found farming successfully in all parts of the State. The influence of these men on the methods adopted in the surrounding area is often very great.

In addition to their function as research centres, it is now planned to make our Experiment Farms the extension centres in the districts in which they are located. In other words, the link between the Experiment Farm and the farmer will be tightened by the Agricultural Instructor, who will maintain much closer touch with the research work than in the past. Advisory Committees

(Continued on page 635.)

SEED OATS FOR 1947 PLANTING.

Emergency Plan Announced by Premier.

OWING to extreme shortage of oat grain and in order to preserve varieties and strains best suited to New South Wales conditions, an emergency plan to purchase and distribute seed oats for 1947 planting has been formulated. Maximum price to grower has been fixed, and the Prices Commissioner will take special action to ensure that these regulations are complied with.

Announcing that details of this plan would be released by the Department of Agriculture, the Premier (Mr. McKell) said that it would provide for the purchase of recommended varieties of seed oats from growers, storage of those varieties separately at depots located within the producing districts, and trucking out from depots in accordance with applicants' orders.

His Government, said Mr. McKell, had decided to take this urgent action to secure seed oats for next year's planting mainly because of failure, due to drought conditions, of oat crops in northern, western and portions of the south-western districts. The Premier appealed to all interested parties to fall in behind the plan. Farmers were asked to make available for seed, all suitable oat crops. Members of the oat grain trade had already promised full support for the scheme.

Maximum prices within New South Wales for the 1946-1947 season were: Seed oats, 4s. 6d. net per bushel to grower; milling oats, 3s. 10d. to grower; feed oats, 3s. 6d. to grower. Price delivered to purchaser on trucks at purchaser's rail station has been fixed at 16s. 6d. per bag for seed oats. The Barley Board pays all charges including rail freight into depots and from depots to purchaser's siding.

The plan would be implemented by the New South Wales Department of Agriculture in cooperation with the Commonwealth Department of Commerce and Agriculture, working through the Australian Barley Board with Messrs. Dalgety and Co. Ltd. as Managing Agent.

Purchasing Details.

Essential details of the plan, as announced by the Department of Agriculture, are as follows:—

Seed oats will be purchased by authorised purchasers appointed by the Australian Barley Board.

The Australian Barley Board will appoint depot keepers within oat producing centres, who will receive oats of seed standard, store, and later distribute in accordance with applicants' orders. Country agents will be permitted to act on behalf of clients, and to have seed oats carted or railed to depots, for which they will receive agent's commission.

Depot keepers will be responsible for quality and quantity, and when necessary will receive assistance from district Agricultural Instructors.

Payment to the growers will be made by the Australian Barley Board through authorised purchasers.

The only varieties accepted will be Algerian, branded (A), Belar (B), Fulghum (F), Mulga (M). The appropriate letter to mark the variety should be stencilled on every bag by the grower. Depot keepers are responsible to see that this is done.

Seed oats will not be accepted in any other than good sound standard cornsacks fit for transport. Fertiliser sacks will definitely not be accepted.

Depots will be established ready to receive seed oats at an early date and most likely they will be located at Albury, Holbrook, Culcairn, Brocklesby, Henty, Balldale, Yerong Creek, Uranquinty, The Rock, Boree Creek, Illabo, Lockhart, Burrumbuttock, Oaklands, Berrigan, Finley, Tootool, Milthorpe. Additional depots, if deemed advisable, may be established.

Distributing Details.

The Australian Barley Board will appoint a country distributing agent within each town to which seed oats is to be railed.

Application forms to purchase seed oats will be available from country distributing agents, or from Messrs. Dalgety & Co. Ltd., 15 Bent-street, Sydney.

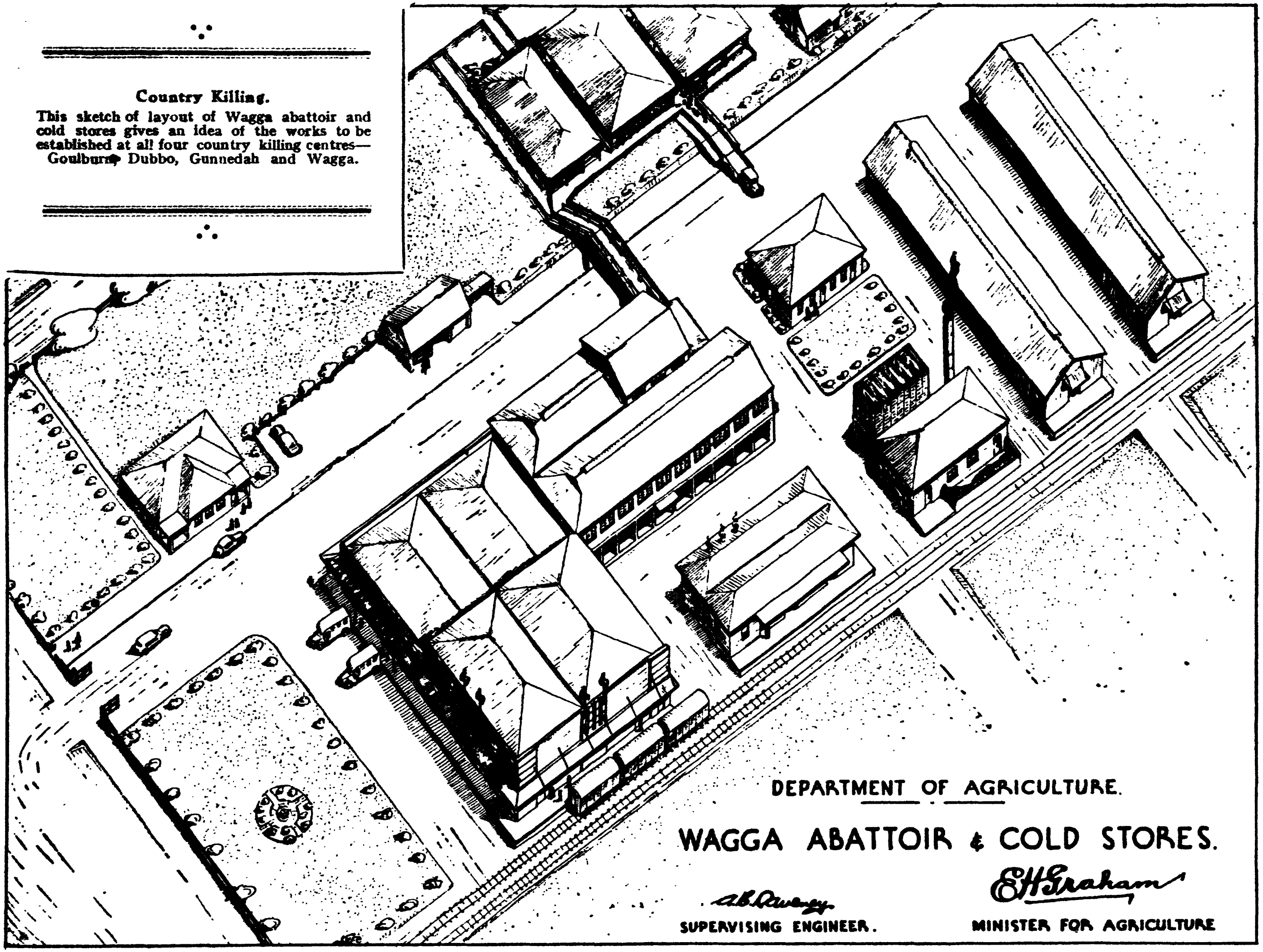
Purchasers of seed oats will contact country distributing agents, complete form of application, and attach cheque in favour of the Australian Barley Board. Distributing agents will remit application forms and cheques to Messrs. Dalgety & Co. Ltd. The Barley Board will be responsible for delivery to purchasers.

The Barley Board will take every precaution to deliver varieties true to type and of seed standard, but does not guarantee to do so.

Closing date for receipt of applications to purchase is Monday, 20th January, 1947, and all applications must be submitted to The Australian Barley Board, c.o. Messrs. Dalgety & Co. Ltd., 15 Bent-street, Sydney, by that date.

Country Killing.

This sketch of layout of Wagga abattoir and cold stores gives an idea of the works to be established at all four country killing centres—Goulburn, Dubbo, Gunnedah and Wagga.



VARIETIES OF WHEAT RECOMMENDED

For 1947 Sowing.

IN recommending varieties for sowing in 1947, the Department again directs attention to the four comparatively new varieties—Gabo, Kendee, Yalta and Celebration—which possess stem rust resistance, moderate to high flour quality and high yielding capacity. These varieties were developed by the University of Sydney and the Department of Agriculture. They are recommended for commercial growing within North-western districts, and for trials on small areas in Central and Southern districts.

WHEAT varieties which are classified as stem rust resistant have proved to be resistant under field conditions to the races of stem rusts which are known to be present in New South Wales. It should be understood that no authority is in a position to guarantee that varieties will maintain the character of stem rust resistance should new races of stem rust occur.

Unless otherwise mentioned the varieties of wheat recommended are suitable for both grain and hay. The accompanying map shows the wheat zones.

Varieties are classed as suitable for "Early Sowing", "Mid-season Sowing" and "Late Sowing" in relation to the normal range of sowing dates for the district. Wheats suitable for early sowing are usually late maturing, and if sown late they may be prematurely hayed off by excessive heat and may also be more liable to destruction by rust. On the other hand, early maturing varieties suitable for "Late Sowing" may, if sown early, come into head prematurely and be destroyed by frost or cold damage. Early maturing varieties should, therefore, *not* be sown early, nor should late maturing varieties be sown late. Within reasonable limits early sowings are likely to be more satisfactory in most districts than late plantings.

NORTHERN WHEAT BELT.

Zone 1: Northern Tableland.

(Armidale, Glen Innes.)

Mid-season Sowing—Ford, Celebration.
Late Sowing—Yalta.

Zone 2: North-western Slopes—Eastern Portion.

(Warialda, Delungra, Inverell, Bingara, Barraba, Attunga, Tamworth, Quirindi and Upper Hunter Districts.)

Early Sowing—Fedweb 1, Ford, Celebration, Bordan (for Upper Hunter).

Mid-season Sowing—Ford, Yalta, Kendee.

Late Sowing—Charter, Gular, Pusa 4, Pusa 111, Gabo.

Zone 3: North-western Slopes—Western Portion.

(Manilla, Somerton, Curlewis, Gunnedah, Boggabri, Mullaley, Tambar Springs.)

Early Sowing—Fedweb 1, Ford, Celebration.

Mid-season Sowing—Yalta, Kendee.

Late Sowing—Charter, Gular, Pusa 4, Pusa 111. Gabo.

Zone 4: North-western Plains.

(Boggabilla, Garah, Gravesend, Pallamallawa, Bellata, Narrabri, Baan Baa, Wee Waa, Pilliga, Baradine, Coonamble.)

Early Sowing—Ford, Fedweb 1 (in limited areas), Celebration.

Mid-season Sowing—Yalta, Kendee, Charter.

Late Sowing—Charter, Gular, Pusa 4, Pusa 111, Gabo, Bungulla (Baradine District).

CENTRAL WHEAT BELT.

Zone 5: Central Tableland.

(Bathurst to Orange Districts.)

Mid-season Sowing—Bordan, Ford, Waratah.
Late Sowing—Waratah.

Zone 6: Central-western Slopes—North-eastern Portion.

(Coonabarabran, Binnaway, Mendooran, Leadville, Coolah, Dunedoo, Gulgong, Mudgee, Wellington, Geurie.)

Early Sowing—Ford, Bordan.

Mid-season Sowing—Bencubbin, Baroota Wonder (for hay only), Eureka 2.

Late Sowing—Gular, Eureka, Bungulla.

Zone 7: Central-western Slopes—Central-eastern Portion.

(Molong, Manildra, Cumnock, Cudal, Cargo.)
Early Sowing—Bordan, Ford.
Mid-season Sowing—Waratah, Bencubbin.

Zone 8: Central-western Slopes—South-eastern Portion.

(Cowra, Canowindra, Eugowra, Goolagong, Koorawatha, Greenethorpe, Grenfell.)

Early Sowing—Bordan, Ford.

Mid-season Sowing—Eureka (for grain only), Waratah, Bencubbin, Koala.

Zone 9: Central-western Slopes—North-western Portion.

(Tooraweenah, Gulargambone, Gilgandra, Eumungerie, Dubbo, Wongarbon, Toongley.)

Early Sowing—Ford.

Mid-season Sowing—Eureka (for grain only), Bencubbin.

Late Sowing—Gular.

Zone 10: Central-western Slopes—South-western Portion.

(Parkes, Forbes, Bogan Gate, Peak Hill, Trundle.)

Early Sowing—Ford.

Mid-season Sowing—Eureka (for grain only), Bencubbin, Baroota Wonder (for hay only).

Late Sowing—Gular, Koala, Baroota Wonder (hay only).

Zone 11: Central-western Plains—Northern Portion.

(Albert, Tottenham, Trangie, Narromine, Condobolin, Euabalong.)

Early Sowing—Bencubbin, Baroota Wonder (for hay only).

Mid-season Sowing—Gular, Koala.

Zone 12: Central-western Plains—Southern Portion.

(Cargelligo, Tullibigeal, Hillston, Merriwagga, Weethalle, Rankin's Springs, Yenda, Griffith.)

Early Sowing—Bencubbin.

Mid-season Sowing—Gular, Bungulla.

SOUTHERN WHEAT BELT.

Zone 13: Southern Tableland.

(Goulburn, Yass, Federal Territory.)

Mid-season Sowing—Ford, Waratah,

Zone 14: South-western Slopes—Eastern Portion.

(Young, Boorowa, Bendick Murrel, Murrumburrah, Wallendbeen, Cootamundra, Stockinbingal.)

Early Sowing—Bordan, Ford.

Mid-season Sowing—Waratah, Bencubbin.

Zone 15: South-western Slopes—Central Portion.

(Bribbaree, Quandialla, Caragabal, Temora, Ariah Park, Barmedman.)

Early Sowing—Bordan, Ford.

Mid-season Sowing—Dundee (for grain only), Bencubbin.

Zone 16: South-western Slopes—Western Portion.

(Wyalong, Ungarie, Barellan, Ardlethan, Tallimba.)

Early Sowing—Ford.

Mid-season Sowing—Dundee (for grain only), Bencubbin.

Late Sowing—Gular.

Zone 17: North-eastern Riverina.

(Junee, Marrar, Coolamon, Wagga, Uranquinty, The Rock, Milbrulong, Lockhart.)

Early Sowing—Zealand (for hay only), Bordan. Ford.

Mid-season Sowing—Dundee (for grain only), Baroota Wonder (for hay only), Bencubbin.

Zone 18: South-eastern Riverina.

(Yerong Creek, Henty, Pleasant Hills, Culcairn, Holbrook, Walbundry, Walla Walla, Gerogery, Jindera, Albury, Tumbarumba, Brocklesby, Balldale, Corowa.)

Early Sowing—Bordan, Ford.

Mid-season Sowing—Dundee (for grain only), Bencubbin.

Late Sowing—Gular.

Zone 19: North-central Riverina.

(Ganmain, Grong Grong, Narrandera, Darlington Point, Boree Creek, Urana.)

Early Sowing—Ford.

Mid-season Sowing—Dundee (for grain only), Bencubbin.

Late Sowing—Gular.

Zone 20: South-central Riverina.

(Rand, Daysdale, Oaklands, Jerilderie, Berrigan, Finley, Tocumwal, Mulwala.)

Early Sowing—Ghurka (for grain only), Ford.

Mid-season Sowing—Ranee and Dundee (for grain only), Bencubbin.

Late Sowing—Gular.

Zone 21: Western Riverina.

(Deniliquin, Mathoura, Moama.)

Early Sowing—Ghurka (for grain only).

Mid-season Sowing—Ranee and Dundee (for grain only), Bencubbin.

Zone 22: Far Western Riverina.

(Moulamein, Balranald, Euston.)

Early Sowing—Ranee (for grain only), Bencubbin.

Zone 23: Murrumbidgee Irrigation Area (on irrigated areas).

Early Sowing—Bordan, Ford.

Mid-season Sowing—Waratah, Bencubbin.

Late Sowing—Waratah.

COASTAL DISTRICTS.

Early maturing varieties for hay or green fodder—Waratah, Florence.

Early Sowing only—Ford.

MAP OF NEW SOUTH WALES
SOUTH PACIFIC OCEAN
TASMAN SEA
QUEENSLAND
STATE OF VICTORIA
STATE OF SOUTH AUSTRALIA
1
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Werringal
Friday,

Dear Jim,

That's good news about your new Fordson "Major" — it looks as though it won't be long before it's right on the job!

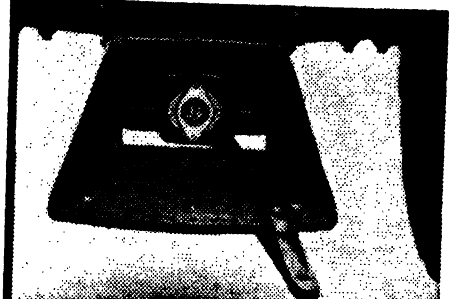
A thought that occurred to me is this — we in Australia are trying to produce as much wheat and other grain as we can, to help the Old Country out, so it's fitting, to my mind, that the tractor which is doing the major share of the "spade work" should be an English one.

And, as you'll find, any servicing or spare parts the Fordson "Major" may need can be quickly obtained — and that means quite a lot!

Best of luck
from your Dad

● (Above)—BELT PULLEY ATTACHMENT —9-in. Belt Pulley.

● (Below)—IMPROVED POWER TAKE-OFF—Conveniently located, centrally mounted.



● (Above)—ADJUSTABLE SWINGING DRAW-BAR.

● (Below)—INDEPENDENT REAR-WHEEL TURNING BRAKES—in addition to hand brake.

● (At Left)—HEAVY DUTY ENGINE—Developing 32 B.H.P. at 1100 r.p.m.; Oil Bath Air Cleaner; Magneto with Impulse Starter; Variable Governor Control and other features, backed by the famous Fordson name. Ask your Fordson dealer.

THE NEW FORDSON "MAJOR"

Sole N.S.W. Distributors:—

MOTOR TRACTORS PTY. LTD.

369-385 Wattle St., Ultimo, SYDNEY.

Telephone: MA 9273. Telegrams: 'Sellmotors,' Sydney.

Notes on Recommended Wheat Varieties.

THE following descriptions of recommended varieties are given as a guide to farmers in the choice of the best varieties of wheat for their conditions. Descriptions and illustrations of Gabo, Kendee, Yalta and Celebration were given in the January, 1946, issue of this journal.

Order of Sowing.

Early sowing—Ford type of wheat.

Mid-season sowing—Bencubbin type of wheat.

Later sowing—Gular type of wheat.

Baroota Wonder.—Essentially a hay wheat of excellent quality and acre yield for mid-season and later sowings. Farmers are strongly urged to sow the headlands of paddocks (which are usually cut for hay) with this variety. The growth is moderately tall, with slender, heavy weighing stems which cure to a desirable green colour. The leaves are moderately sparse, and generally free of disease troubles. The variety is slightly resistant to flag smut, but is susceptible to stem rust.

Bencubbin.—A popular wheat of mid-season sowing, highly resistant to flag smut, and possessing only a moderate susceptibility to stem rust. On account of its tall growth and tendency to lodge, it should not be grown on over-rich soils or in districts of high rainfall, where Ford is a better variety. The grain bleaches fairly readily, and although classed as a weak flour wheat, it matures a bright grain of moderately good flour when grown within the lower rainfall districts. It is recommended for dry districts in place of Nabawa. The area sown to this variety has become excessively great, and its part replacement with medium strong varieties would ease some problems connected with flour blends and export shipments.

Bordan.—A variety lately recommended for early sowings within favoured rainfall districts. It is tall growing, moderately resistant to stem rust and flag smut, and the grain is of the medium strong flour class. In many respects Bordan resembles Ford, and is likely to replace it in districts of good rainfall, as it has a higher yielding capacity. It does not, however, finish quite as well should the late spring conditions be dry. As a hay wheat, it is not quite the equal of Ford in quality.

Charter.—Recommended for the first time in 1945 for the northern sections of the wheat belt. In maturity it falls between mid-season and early maturing wheats. It is highly resistant to stem rust, and to flag smut and may be classed as a strong or "premium" wheat, the grain of which is frequently vitreous. Its straw is tall and somewhat Ford-like, so that Charter can scarcely be recommended for planting on heavy soils in preference to a strong-strawed wheat. Its straw is, at least not inferior to that of Gular or of the recommended Pusas, with which it competes in late sowings. It may also replace some Bencubbin, the straw quality of which is decidedly inferior to that of Charter. It may prove to be a desirable early hay wheat.

Dundee.—A productive variety for mid-season sowing; moderately short strong straw; moderately resistant to flag smut but very susceptible to stem rust and susceptible to frost damage. It is classed as a medium strong flour wheat, and under suitable dry ripening conditions produces a vitreous grain, but it frequently produces a mottled grain. In view of the extreme susceptibility of Dundee to stem rust, it is considered that its cultivation should be reduced in areas where other wheats of approximately equal yielding ability are available.

Eureka.—A mid-season sowing wheat of medium height and strong straw. Susceptible to stem rust and moderately susceptible to flag smut. It is a high-yielding variety and produces a medium-strong flour of high quality.

Fedweb 1.—A short, strong straw variety suited to early sowings, particularly within the North-western portion of New South Wales. It is highly resistant to stem rust but susceptible to leaf rust, flag smut and Septoria. The grain, which is held firmly, is in the medium strong flour class and is of high quality.

Florence.—A wheat suited to late sowings, with tall tender straw. Moderately resistant to flag smut and to stem rust. Highly resistant to bunt. The grain is very subject to shedding. It is generally hard and vitreous, with medium strong flour. Recommended only for green fodder and hay in coastal districts.

Ford.—A variety suited to early sowings within favoured rainfall areas. It is tall growing, possessing straw which picks up and combs well, or makes into good hay of good colour and quality; it is moderately resistant to stem rust and flag smut, and the grain is of the medium strong flour class. Ford "finishes" better than most varieties even though the late spring may be dry, and the grain also appears to have a satisfactory resistance to bleaching. It is recommended for extensive sowings in all but the lower rainfall districts.

Ghurka.—A variety suited to early sowing within the Western Riverina, possessing very short strong straw. Resistant to flag smut and has some resistance to stem rust. Grain of weak flour strength.

Gular.—A wheat suitable for late sowing within favoured districts and for mid-season sowing within the drier districts. It is susceptible to flag smut and to stem rust. It is in the medium strong flour class. The grain is generally hard and vitreous, Being but little inferior to Pusa 4 in baking quality, and therefore a high premium wheat.

Koala.—An early maturing, moderately short and strong-strawed wheat which is very attractive to the farmer in field characteristics. It is however, only moderately resistant to flag smut

and susceptible to stem rust. It has an attractive grain which in bushel weight is superior to that of most other varieties. In baking quality it is certainly superior to Waratah which it is likely to replace to some extent.

Pusa 4.—A late sowing variety with slender straw. Somewhat resistant to flag smut. Susceptible to stem rust. Grain generally hard, and in the strong flour class. On account of its relatively light yield it is suitable only for a few localities in northern districts.

Pusa 111.—A smooth-chaffed selection from Pusa 4, to which it is similar in all other characters.

Ranee.—A mid-season sowing wheat, with short, fine but strong straw. Susceptible to flag smut and to stem rust. A weak flour wheat.

Waratah.—A tall-growing variety suited to mid-season sowing. The straw is slender, but picks up and combs well should the crop become lodged. It is susceptible to flag smut. The grain is of the weak flour class. Ripe crops are liable to shed. Most of the area previously sown to Waratah is now sown to Bencubbin.

Zealand.—A variety suited to early sowing and which produces high yields of hay of excellent quality in favourable districts. It is highly resistant to flag smut, but susceptible to stem rust. The straw is very tall, but stands fairly well. It is recommended only for hay.

OATS AND BARLEY RECOMMENDATIONS For 1947 Sowing.

ONE of the essentials to success in the growing of the winter cereals, oats and barley, is to sow varieties suited to the climatic and soil conditions.

Following are the recommendations of the Department of Agriculture for the 1947 sowing season for different districts and purposes:—

OATS.

North Coast.

For early green fodder—Sunrise, Buddah.

For grazing—Fulghum, Algerian.

South Coast.

For early green fodder—Belar, Sunrise, Mulga, Buddah.

For grazing—Algerian, Fulghum.

For late green fodder—Algerian.

Northern Tableland.

For grain, hay, or grazing (autumn sowing)—Algerian.

For grain or hay (autumn sowing)—Lampton.

For grazing only (autumn sowing)—Fulghum.

For grain or hay (spring sowing)—White Tartarian, Lampton.

Central Tableland.

For grain, hay, or grazing (autumn sowing)—Algerian.

For grain or hay (autumn sowing)—Lampton, Weston.

For grazing only (autumn sowing)—Fulghum.

For grain or hay (spring sowing)—White Tartarian, Lampton.

Southern Tableland.

For grain, hay, or grazing (autumn sowing)—Algerian.

For grain or hay (autumn sowing)—Lampton.

For grazing only (autumn sowing)—Fulghum.

For grain or hay in coldest parts (spring sowing)—White Tartarian, Lampton.

North-western Slopes and Upper Hunter.

For grain, hay or silage—Algerian, Belar, Burke, Mulga, Buddah.

For grazing—Algerian, Burke, Fulghum.

Central-western Slopes.

For grain, hay or silage—Algerian, Belar, Burke, Weston.

For grain, hay or silage in drier parts—Gidgee.

For grazing—Algerian, Burke, Fulghum.

South-western Slopes and Eastern Riverina.

For grain, hay or silage—Algerian, Belar, Burke.

For grazing—Algerian, Burke, Fulghum.

Western Plains and Western Riverina.

For grain, hay or silage—Belar, Burke, Gidgee, Mulga.

For grazing—Burke, Fulghum.

Murrumbidgee Irrigation Area.

For grain, hay or silage—Algerian, Belar, Burke.

For grazing—Algerian, Burke, Fulghum.

BARLEY.

Recommended Varieties.

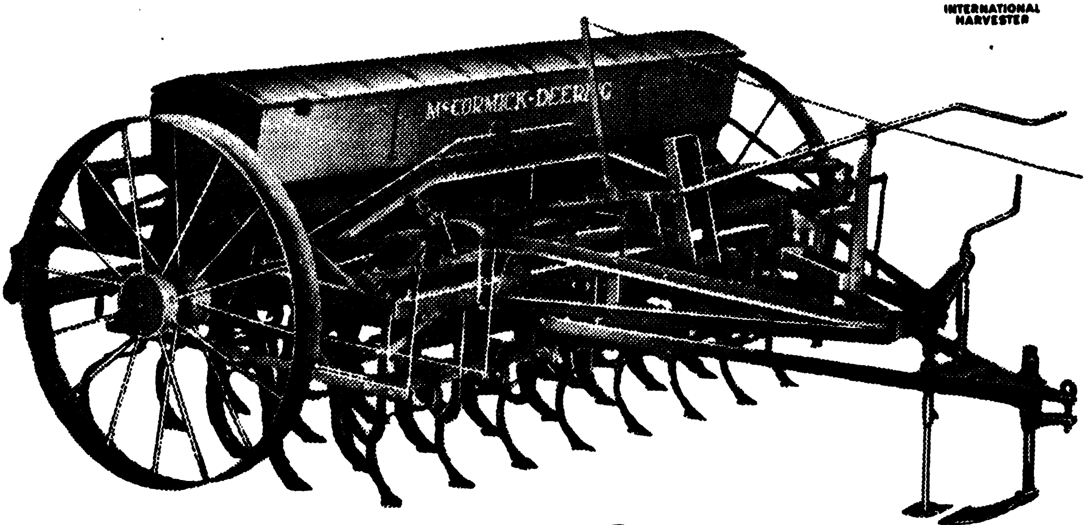
The varieties of barley recommended by the Department are:—

Malting or two-row type—Pryor.

Feed or six-row type—Trabut (for green fodder or grain).

The NEW
McCORMICK-DEERING

INTERNATIONAL HARVESTER



"Power-Lift"
CULTIVATOR DRILL

DESIGNED EXPRESSLY FOR TRACTOR OPERATION . . .

THE McCormick-Deering GL-130-T Power-lift Cultivator Drill is an entirely new development in tractor-operated Seeding Machines . . . . It incorporates many new and improved features of especial advantage to *all* tractor farmers —some of these features are described in this advertisement.

ONLY the McCormick-Deering Power-lift Cultivator Drill has all these new features . . . You'll be wise to investigate fully this new, tractor-operated seeding machine . . . Ask your local agent to tell you more about it, or, if you prefer, to send you an illustrated and descriptive catalogue.

See Your Nearest
INTERNATIONAL HARVESTER AGENT

INTERNATIONAL HARVESTER COMPANY OF AUSTRALIA PTY. LTD. (INC. IN VIC.)
BRANCHES IN ALL CAPITAL CITIES. FACTORY: GEELONG

Ask about these entirely new features:

- Built-in Power Lift and Depth Indicator.
- Two separate variable-speed gear boxes for grain and fertiliser drives.
- Parallel-lift tine floats designed for even penetration and high, level lift.
- Large capacity, all-steel, weather-proof grain and fertiliser box.
- Self-adjusting reinforced feed tubes—free-flowing, non-clogging, and better clearing.
- Roller bearings in self-aligning axle boxes.

McCORMICK-DEERING

Keep your Savings up and prices down
BUY SAVINGS CERTIFICATES

Seed Wheat and Oats for 1947 Sowing.

List of Growers of Approved Seed.

IT has been decided to publish again this year a list of growers of approved seed wheat and oats who have supplies available for sale. The crops of the growers listed were inspected by officers of the Department and reached a standard of purity and trueness to type up to the approved standard.

Growers listed should notify the Department immediately their available seed of any variety is exhausted.

Wheat.

Baldmin.—
Marshall, A. O. & B. C., "Pinelodge," Canowindra.
Trengrove, C. D., "Hillview," Koorawatha.

Baringa.—
Capps, A. E., & Sons, Wynfield, Cowra.

Bencubbin.—
Stewart, J. M., "Bygoo," Ardlethan.
Stewart, J. L., "Meroola," Ardlethan.
Hawthorne, J. W., "Uley," Ardlethan.
Elder, J. L., "Rockhall Mains," Kamarah.
Carroll, F. J., "Killara," Ardlethan.
Richens, T. E., "Warrawee," Ardlethan.
Turnbull, J., & Son, "Sherwood Park," Ardlethan.
Danaher, T. W., "Mine View," Ardlethan.
Hawthorne, F. A., "Uley," Ardlethan.
Ballantyne, G. G., "Clifton," Ariah Park.
Renshaw, C., "Boogadah," Binnaway.
Heath, H. H., "Eugildry," Leadville.
Rowbotham Bros., Box Valley, Dunedoo.
Sullivan, T. P., Dunedoo.
Hookway, S., "La Questa," Leadville.
Deutcher, Les., Eden, Birriwa.
Ewin, C., "Fenella," Birriwa.
Granger, F. H., Black Hill, Birriwa.
Cummins, Est. P., Broula, Cowra.
Marshall, A. O. & B. C., "Pinelodge," Canowindra.
Ward, G., "Girrawheen," Grenfell.
Keir, J. A., "Braeside," Grenfell.
Wood, K., "Boongalla," Rocky Glen, via Coonabarabran.
McEvoy, J., "Levuka," Gugaldie.
Howe, K., Bungowannah.
Ross, R. D., Brocklesby.
Ross, C. E., Brocklesby.
Ross, S. W., & Shipard, G. B., Brocklesby.
Hutson, F. O., Walbundrie.

Bobin.—
Reid, G., Moorwartha.

Bordan.—
Stewart, J. L., "Meroola," Ardlethan.
Stewart, J. M., "Bygoo," Ardlethan.
Weir Bros., Holmwood, via Cowra.
Payten, J., "Kaloola," Goolagong.

Dundee.—
Aitken, W. H., "Afton," Beckom.
Carroll, F. J., "Killara," Ardlethan.
Danaher, T. W., "Mine View," Ardlethan.
Black, R. B., "Braemar," Greenthorpe.

Dundee—continued.
Howe, K., Bungowannah.
Ross, C. E., Brocklesby.
Ross, S. W., & Shipard, G. B., Brocklesby.
Humphries, K., Bungowannah.

Eureka.—
Renshaw, C., "Boogadah," Binnaway.

Eureka 2.—
Ballantyne, G. G., "Clifton," Ariah Park.

Ford.—
Stewart, J. L., "Meroola," Ardlethan.
Carroll, F. J., "Killara," Ardlethan.
Black, R. B., "Braemar," Greenthorpe.
Capps, E. A., & Sons, Wynfield, Cowra.
Walker, F. W., "Glenelg," Canowindra.
Keir, J. A., "Braeside," Grenfell.
Ross, C. E., Brocklesby.
Frohling, W., Moorwartha.
Hutson, F. O., Walbundrie.

Gabo.—
McColl & Sons, H. O., "Strathmore," Koorawatha.
Black, R. B., "Braemar," Greenthorpe.

Ghurka.—
Stewart, J. M., "Bygoo," Ardlethan.

Gular.—
Stewart, J. M., "Bygoo," Ardlethan.
Hutson, F. O., Walbundrie.

Koala.
Cummins, Est. P., Broula, Cowra.
Payten, J., "Kaloola," Goolagong.
McEvoy, J., "Levuka," Bugaldie.

Pusa 4.—
Stewart, J. L., "Meroola," Ardlethan.
Aitken, W. H., "Afton," Beckom.

Rapier.—
Aitken, W. H., "Afton," Beckom.
Stewart, J. L., "Meroola," Ardlethan.
Stewart, J. M., "Bygoo," Ardlethan.
Weir Bros., Holmwood, via Cowra.
McColl, H. O., & Sons, "Strathmore," Koorawatha.
Marshall, A. O. & B. C., "Pinelodge," Canowindra.

Totadgin.—
Aitken, W. H., "Afton," Beckom.

(*Continued on page* 635.)

THE CONTROL OF SHEEP KED
(Melophagus Ovinus).

Experiments with D.D.T. and "666."
Used in a Power Spray Unit.

G. J. SHANAHAN, B.Sc.Agr., Assistant Entomologist.

THE sheep ked (*Melophagus ovinus*) can become a serious external parasite in the ked areas of this State unless satisfactory control means are used. Varying degrees of control may be obtained by spraying with or dipping in derris root, carbolic acid and arsenical preparations. Whilst proprietary mixtures containing one or a combination of these ingredients kill the adult keds, the pupae are not all destroyed. The majority of the keds hatch out from the resistant pupae within twenty-two days after deposition.* The wool does not always retain sufficient of the active ingredient to kill the young keds, which, under favourable conditions, multiply rapidly and spread throughout a flock.

A toxic principle for incorporation in a bath mixture, which would kill both adult keds at the time of treatment and the young keds, which emerged later, would be welcomed by the wool industry. As D.D.T. and "666" remain toxic to some insects under certain conditions for a considerable time, an experiment was arranged in the Murrurundi district to determine the effect of these synthetic insecticides on the sheep ked.

Details of the Experiment.

Emulsionas of D.D.T. at 0.25 per cent., 0.05 per cent. and 0.075 per cent. concentration of para-para-isomer were prepared from proprietary lines of D.D.T. A laboratory prepared emulsion of benzene hexachloride ("666") which gave a 0.01 per cent. gamma isomer content liquid was also used.

The D.D.T. and "666" emulsions were applied with a power spray unit fitted with a 2½-inch centrifugal pump which delivered 170 gallons per minute from a sump with a capacity of 600 gallons.

In order to comply with the stocking arrangements on the property it was not possible to have a similar number of sheep in each treatment group. The experimental sheep were arranged in four groups—A, B, C and D (of 116, 232, 318 and 327 sheep respectively)—and were sprayed in pens of approximately 80 sheep† for six minutes—three minutes with both top and bottom sprays. The spraying was carried out straight off shears. Three sheep retained a gallon of fluid. The concentration of D.D.T. and "666" used in the respective treatment groups are shown in the table of results.

* N. P. H. Graham, & K. L. Taylor, C.S.I.R. (Aust.) Pamphlet No. 108, p. 14. 1941.

† Group A comprised two pens of 80 and 36 sheep respectively.

For observation purposes six sheep were marked in each pen of 80 sheep in a treatment group. All the marked sheep for each treatment were kept together for three days after treatment. Unfortunately it was not possible to isolate the six sheep from each pen within a treatment. Furthermore, it was necessary to mix all the marked sheep from the four treatment groups after three days. Ked counts of the marked

Sheep Ked ("Tick") (*Melophagus ovinus*). Engorged female, enlarged. (From Imes, 1917.)

sheep were made after one, two and twenty-eight days from spraying.

The main groups were returned to their paddocks after treatment and will be segregated until shearing with the exception of the 0.025 per cent. and 0.05 per cent. D.D.T. groups which were mixed to enable them to be placed in one paddock. After twenty-eight days, 20 per cent. of the sheep in each of the main groups were examined for ked.

Samples of each spray treatment were taken at intervals throughout the spraying. They were obtained whilst the spray unit was in operation, from the liquid as it was returning to the sump and were collected at the commencement of the spraying of each pen of sheep. A final sample was drawn from the returning fluid towards the end of the last pen in each group.

Results.

The accompanying table of results shows the number of keds found per six marked sheep from each pen in each treatment after one, two and twenty-eight days. The keds were usually found in the long wool of the neck and on the brisket of the sheep which had been badly shorn.

The examination of 20 per cent. of each of the main treatment groups twenty-eight days after spraying gave the following information:—

Groups A and B (combined group).—Two live keds and several, well-advanced, live pupae were recovered from the long wool underneath the neck.

Group C.—There were no live keds on the sheep examined in this group. One live pupa was obtained.

Group D.—The long wool under the neck contained two live keds and several live pupae.

Young dead keds were obtained from the long wool of sheep from each treatment group.

Analyses of the Spray Treatments.

The chemical analyses of the spray samples have not been completed. It has been found that there is a gradual decrease in the para-para-isomer content in all D.D.T. groups, *e.g.*, in the 0.075 per cent. D.D.T. group the concentration of para-para-isomer fell to 0.060 per cent. after four pens of sheep had been sprayed.

Comments.

Twenty-four hours after treatment each marked sheep was carrying dead keds. Some live keds were present on the marked sheep from each group one and two days after spraying. All live keds were located in the long wool under the neck and on the brisket. The wool in these areas was up to

TABLE showing Results of Spraying Ked-infested sheep with D.D.T. and "666."

Group.	Treatment.	No of Sheep per Treatment Group.	Group Pens.	Number of Keds on six Marked Sheep from each Pen within a Treatment Group after.—		
				1 day.	2 days.	28 days.
A ...	D.D.T. emulsion 0.025 per cent. para para isomer.	110	1	4	3	0
			2	2	2	1
B ...	D.D.T. emulsion 0.05 per cent. para para isomer.	232	1	2	1	0
			2	2	0	0
			3	2	1	0
C ...	D.D.T. emulsion 0.075 per cent. para para isomer.	318	1	7	1	0
			2	12	6	0
			3	7	7	0
			4	17	7	0
D ...	"666" emulsion 0.01 per cent. gamma isomer.	327	1	3	0	0
			2	1	2	0
			3	6	3	0
			4	33	20	3

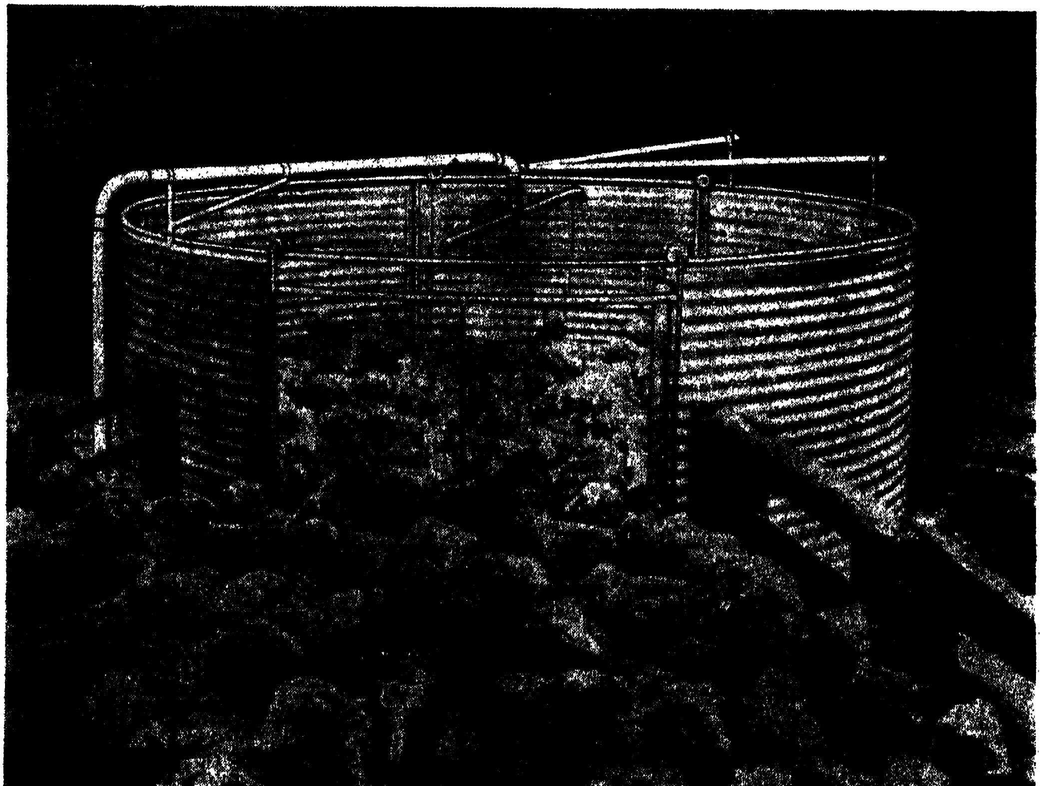
1 inch long, in many instances and was extremely difficult to saturate. The surviving keds, which were afforded some degree of protection by the long wool, would not be affected until they began to migrate from the non-toxic zones of wool. The migration of the keds to the toxic zones may explain the gradual decrease in ked numbers. At the same time, it is realised that there is a natural decrease in the number of keds which remain on a sheep following shearing.

The long wool under the neck and on the brisket contained a number of pupae also. The majority of the keds would hatch from the pupae within twenty-two days. The ked counts made in the marked sheep after twenty-eight days indicate that most of the keds which hatched after the sheep were sprayed were killed. Since all the marked sheep were run together after the third day from treatment, and, furthermore, as the keds migrate from sheep to sheep, the ked counts of the marked sheep may not give a reliable guide to the efficacy of the four treatments. However, in view of the live ked counts obtained from 20 per cent. of three main groups after twenty-eight days (the 0.025 per cent. and 0.05 per cent. D.D.T. groups were mixed), it is evident that the majority of the keds, which survived the treatment or hatched from the resistant pupae subsequent to treatment, were destroyed.

At the inspection of the main treatment groups after twenty-eight days some sheep in each group contained several recently dead keds. Hence it is concluded that the wool remained toxic to the keds for twenty-eight days.

Although the majority of pupae hatch within twenty-two days of deposition, pupae containing live, developing keds were observed on sheep in the three main groups at the final examination.

The chemical analyses of the samples taken at the commencement and the end of the 0.075 per cent. D.D.T. group, in which 318 sheep were sprayed in four pens, showed that the para-para-isomer content of the



A Power Spray Unit of the Type Used in the Murrurundi Experiment.

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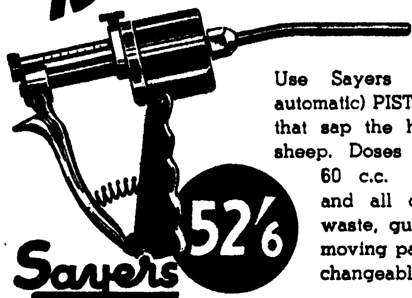

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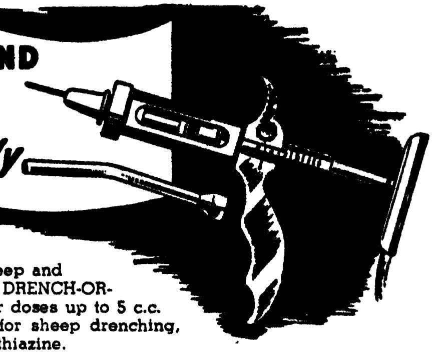

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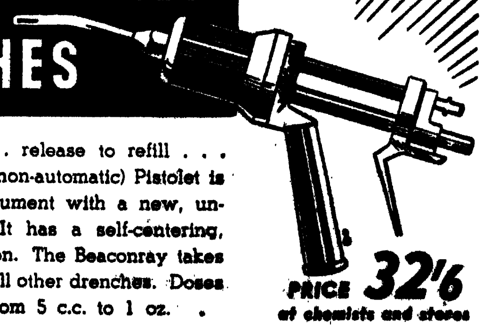


Press to dose . . . release to refill . . . Sayers Beaconray (non-automatic) Pistolet is a sturdy little instrument with a new, unbreakable barrel. It has a self-centering, self-expanding piston. The Beaconray takes Phenothiazine and all other drenches. Doses easily adjustable from 5 c.c. to 1 oz.

★ **Sayers BEACONRAY (non-automatic) PISTOLET**

emulsion fell to 0.065 per cent. concentration. There has thus been a slight reduction in the para-para-isomer content of the D.D.T. emulsion at this concentration.

The large number of keds on the marked sheep from the fourth pen of the "666" group is interesting. It would seem that the gamma isomer content of the liquid was so reduced after the third pen that a large number of keds were able to survive on the six sheep from the fourth pen. However, it should be noted that only two live keds were observed in the sheep examined from the main "666" group after twenty-eight days.

There were no symptoms of either toxicity or skin irritation in the sheep from all treatments in the experiment.

Summary and Conclusions.

1. Emulsions of D.D.T. at 0.025 per cent., 0.05 per cent. and 0.075 per cent. para-para-isomer concentrations and a "666" emulsion at 0.01 per cent. gamma isomer content were effective in reducing the adult ked population on sheep within twenty-eight days of spraying in a power-spray unit.

2. Since recently dead keds were observed in the wool of sheep from both the D.D.T. and "666" main groups twenty-eight days after treatment, it may be concluded that both these compounds have a residual toxicity in the wool for this period.

3. Some developing, live pupae were found in sheep from each of the main groups after twenty-eight days.

4. In all treatments the live adult keds on the marked sheep were located in the long wool under the neck and brisket. This wool was not saturated at the time of treatment.

5. The para-para-isomer content of the 0.075 D.D.T. emulsion with which 318 sheep were sprayed in four pens, was reduced to 0.060 per cent. concentration.

6. In the "666" group, in which 327 sheep were treated in four pens, the results indicate that after three pens the emulsion is less toxic to the keds than in the previous pens.

Acknowledgments.

The writer desires to acknowledge the assistance given by Wright Bros., of Bickham Stud, Blandford, who kindly made their spray race unit and approximately 1,100 ked-infested sheep available for the experiment, and by Mr. A. C. Sundstrom, of Buzacott-Wolseley Pty. Ltd., Sydney. Thanks are due to Mr. O'Neill of the Chemist Branch, for the analyses of the dipping samples.

Value of Government Experiment Farms—*continued from page* 623.

of local farmers will take an active part in planning Experiment Farm research programmes to meet local needs.

They Pay Handsome Dividends.

Government Farms are often criticised because they do not pay. If performing their proper functions, they have no hope of paying, and, indeed, if they did pay it would be pretty conclusive evidence that they were not doing their job. Experiment Farms must employ a considerable number of highly trained people, and are required to try out many methods involving costly procedure. Under such circumstances, to make them pay would be quite impossible. Inasmuch as they breed high yielding varieties of crops, produce high quality livestock, and evolve improved farming practices, all of which contribute to a higher level of agricultural efficiency, it may be claimed that they show handsome dividends.

Seed Wheat and Oats for 1947 Sowing—*continued from page* 631.

Turvey.—
Reid, G., Moorwartha.
Frohiing, W., Moorwartha.

Waratah.—
Weir Bros., Holmwood, via Cowra.
McColl, H. O., & Sons, "Strathmore," Koorawatha.

Oats.

Algerian.—
Capps, E. A., & Sons, Wynfield, Cowra.

Belar.—
Robinson, J. W., "Tallandoon Park," West Wyalong.
Black, R. B., "Braemar," Greenthorpe.
Hockings, J., Bumbaldry, via Cowra.
Batkin, E. A., Greenthorpe.
Humphries, K., Bungowannah.

Burke.—
Marshall, A. O. & B. C., "Pinelodge," Canowindra.

DAIRY FARM BUILDINGS.

Influence the Quality of Dairy Products.

Plans and Specification of Milking Bails and Milk or Separator Room are Available.

THE situation of Australia in regard to her markets for surplus dairy products is such that a period of up to twelve months may elapse before the goods are consumed. To stand up to the conditions of transport, storage and time required to market butter and other milk products in London, it is essential that the highest quality products be manufactured. The first essential in manufacturing a high class article of dairy produce is a sound, high-quality raw product—which is milk.

Butter-fat of milk will readily absorb any unpleasant odours from the atmosphere, and under favourable temperature conditions will rapidly undergo bacterial decomposition with the production of unpleasant odours and unpalatable flavours, thereby reducing the life and the sales value of the finished products. Milk or cream must therefore be handled and stored in a clean-smelling, dust-free atmosphere.

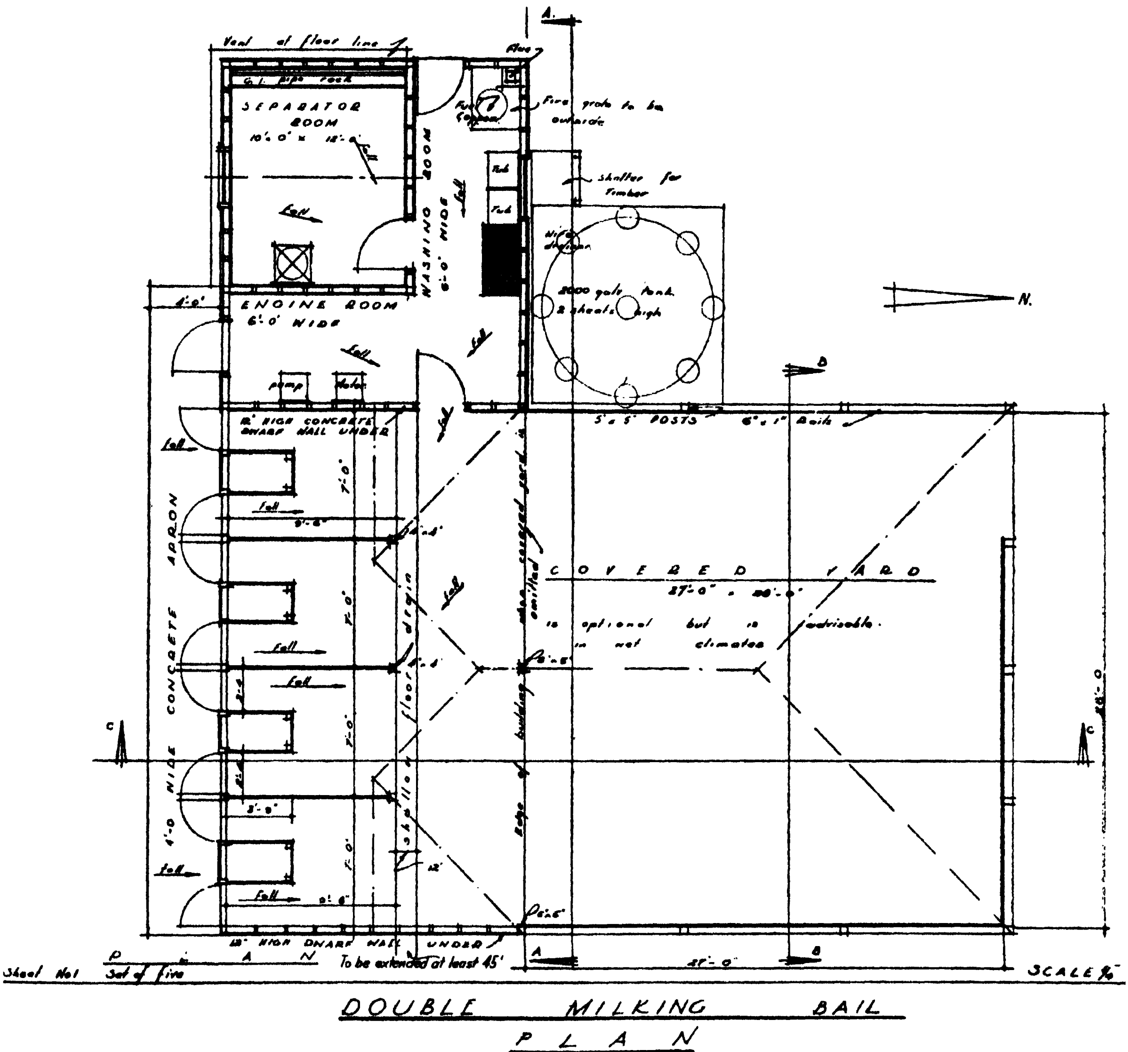
To enable the dairyman to ensure the desired degree of protection without incurring more than the minimum expenditure, the Department has prepared working drawings of double milking bails with separator room attached. These are available free of charge, to those interested.

The Dairies Supervision Act is administered by the Minister for Agriculture, who delegates certain powers under the Act to officers of the Division of Dairying of his department, and these officers are available to render technical assistance to both dairymen and Local Authorities. The plans available indicate the standards which are necessary to ensure registration of dairy premises.

Under the Dairies Supervision Act, all dairies must be registered with a Local Authority—represented by the municipal or shire council or a police officer. On receipt of an application for registration, a Local Authority shall, within fourteen days, register the applicant or notify the applicant that registration has been refused. The object of this legislation is to maintain a high standard of quality in one of our most important foodstuffs—for the betterment of the health of the consumer and the enhancement of the returns to the producer.

The plan of the double milking bail is shown in the accompanying illustration. It is a design which has been adopted fairly extensively by the industry on the North Coast, and shows a covered yard, the purpose of which is to enable the cows to come into the bails in a reasonably dry condition in wet weather—and therefore has most application in wet climates. This covered yard is not needed in the drier areas of the State and to meet the needs of farmers in such areas, a list of quantities of materials required to erect the premises without the covered yard is also available.

All farmers will not need a four double-bail milking shed, in which case they can reduce the number according to the size of the herd likely to be carried and make an estimate of the reduction of materials required for the smaller building. In some cases a separator or milk storage room, 10 feet x 12 feet, is not considered to be large enough, and some dairymen have increased its size. This applies in cases where whole milk is being supplied to a factory. The number of cans required in the transport of the milk in a large dairy when the cows are in full milk is liable to cause some measure of congestion in a 10 feet x 12 feet dairy.



Plan of Double Milking Bail with Milk or Separator Room Attached.

In the location and erection of the bails the farmer should endeavour to protect himself from the effects of bad weather (rain and wind), from the afternoon summer sun, and, on the coast, where the majority of dairies are situated, to obtain the benefit of the summer north-east winds.

Bad weather (rain and cold, driving winds) mostly come from the south, south-west and south-east. Cold winds without rain come from the west in winter, and hot winds from the same direction in summer. Under these conditions the farmer should face the entrance to the bails due north, or slightly east of north. This aspect not only gives him the weather protection he desires, but also (very important from a sanitary point of view) allows entrance to the bails of the maximum forenoon sun.

On the coast the prevailing cool summer wind is from the north-east and the milkers and stock need to have the utmost benefit from this.

FRUIT GROWING.

APPLE GROWING IN NEW SOUTH WALES.

(*Continued from page* 534.)

H. BROADFOOT, Chief Fruit Instructor, and E. C. WHITTAKER, Fruit Instructor.

IN the previous sections of this article (which commenced in August issue) the authors have discussed the economics of the industry, with special emphasis on the need for utilisation of areas particularly suited to this crop, and have dealt with soils and varieties.

The present instalment is devoted to a discussion of the stocks used in the propagation of apple trees.

Stocks for Apple Trees.

In the early days of apple growing in New South Wales it was customary to use apple seedlings as stocks. With the introduction of woolly aphis, however, the use of free seedlings had serious drawbacks, as in many cases the roots of seedlings become heavily infested with this pest, with serious results so far as the growth of varieties worked on to them was concerned.

The *Aphelinus mali* parasite or woolly aphis was then unknown and control measures in general against pests and diseases were nothing like as efficient as they are to-day. Consequently when one or two varieties became known as immune to the ravages of the aphis, interest naturally centred on them as stocks.

Of these, the Northern Spy variety was outstanding regarding immunity from aphis and ease of propagation, the consequence being that from the early 1900's until only a few years ago, very few apple trees were worked on to anything except Northern Spy roots.

During recent years, however, the Spy stock has fallen into considerable disrepute —not all of which is entirely justified.

Stocks undoubtedly play a most important part in the growth and longevity of trees, but it is well to remember that if there is a lack of one of the other factors necessary for the continued satisfactory growth and cropping of apple trees, particularly adequate soil moisture and plant nutrients, then no matter what type of stock is used, the result is unlikely to be satisfactory.

Jonathan Apple Tree on Northern Spy Stock in the Batlow District.
Healthy and Vigorous at thirty years of age.

A Typical Granny Smith Apple Tree on Northern Spy Stock in One of the Poorer Apple Areas.

The Northern Spy Stock.

The Northern Spy itself is an inherently vigorous and reasonably deep-rooted tree. but when used as a stock for some of our varieties it tends to change its rooting habit to some extent owing to a certain amount of incompatibility. Varieties such as Granny Smith and Democrat, for instance, worked on to Spy stocks develop a comparatively poor and shallow root system which tends to induce an early decline in growth and productivity.

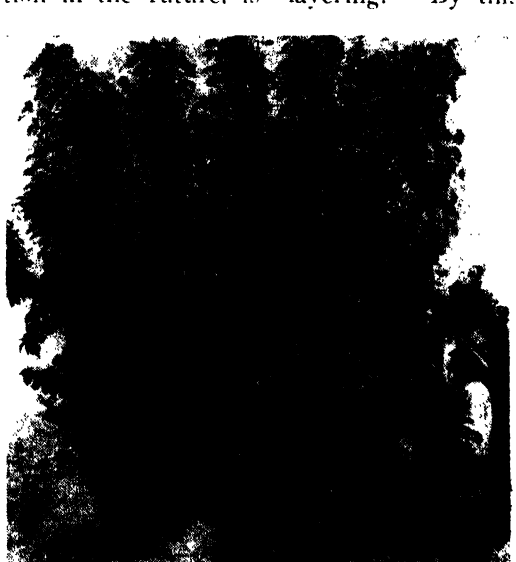
Nevertheless in certain favoured areas of good soil and bountiful rainfall, such as Batlow, Spy stocks produce a reasonably large, productive and consistent cropping tree. This is in marked contrast to many other areas of lower rainfall and poorer soil, where trees on Spy stocks have proved to be short lived and of erratic cropping habits. It would appear, therefore, that very favourable growing conditions will overcome to some extent at least the drawbacks attendant on the incompatibility between Spy stocks and some of our best varieties. However, this should not be taken as inferring that even under the best of natural conditions, other and more vigorous stocks would not be a better paying proposition in the long run, and as for the poorer or marginal areas, it is extremely doubtful if the adverse effects of unfavourable climate, poor soil and low rainfall can be countered by the use of other than Spy stocks to make the growing of apples in such areas a payable proposition.

Seedling Stocks Now Favoured.

During the past few years there has been a very marked swing away from the Northern Spy stock and a return to selected seedlings as root stocks. At the present time, although it is still possible to obtain trees worked on Northern Spy stocks, the demand for apples worked on seedling stocks is increasing year by year, and it is safe to say that the bulk of new plantings in the recognised good apple growing areas will, in future be on seedling stocks.

Layering and Root Grafting.

It must not be inferred that seedlings are the only alternative to the use of Northern Spy as stocks. Another method of propagation, which has to date been but little used but nevertheless is worth serious consideration in the future, is "layering." By this



A Well-grown Eight-years-old Granny Smith Apple Tree on Seedling Stock.
Typical of many such trees in the Batlow district.

means the trees are grown on their own roots, and hence there can be no question as to the degree of compatibility between stock and scion. Indications from the stock trial work being carried out by this Department are that certain varieties of apples grown on their own roots will prove exceedingly satisfactory.

A more commonly used alternative to the use of whole seedling stocks is by means of "root grafting." This is an economical and very successful method of utilising stock material whereby a small section of young root is grafted direct to the scion. The resultant graft is then planted in the nursery and in from one to two years, is ready to

Delicious Apple Trees at Bathurst Experiment Farm, Twelve Years Old.
Left.—On Northern Spy Root Stock. *Right.*—On Seedling Root Stock.

plant out in its permanent position. By planting root-grafted trees fairly deeply it is possible to induce most varieties to root readily from the stem, thus giving the advantages derived from growing them on their own roots as outlined above.

Considerable experimental work has been carried out over the past twenty years by this Department, and it is now possible to recommend certain types and varieties of stocks for all of our main varieties.

Included in the root stock trials in this State are clonal root stocks some of which have been raised locally and some imported. Whilst it is yet too early to make any definite recommendations concerning these stocks, the results to date after twelve years' work are very promising.

Owing to vastly improved control methods it is not considered that the woolly aphis presents an insuperable obstacle to the growing of seedlings as stocks, and the increased size of the trees, together with much greater longevity and more consistent and heavier crops, more than offset the risk of damage by aphis.

(To be continued.)

THE ROLE OF ORGANIC MANURES
In Citrus Nutrition.

Soil Texture Improvement, Rather Than Source of Plant Food.

R. J. BENTON, Special Fruit Instructor.

THE demand for organic fertiliser materials has increased until the stage has been reached that the supply is insufficient to meet the demands of citrus growers in most areas of State. As a consequence the cost of the various products available has advanced considerably, especially in very recent years.. The landed-on-the-farm cost (about six years ago) of about £1 per ton has at least trebled. In some particular cases, growers are paying up to £4 10s. per reputed ton for sheep, fowl or mixed manures.

In many instances this type of manuring, which is supplementary to the use of fertilisers, is practised not because previous experience has proved the benefit of applications, but rather as a "stab in the dark" in an endeavour to increase productivity by the promotion of better growth in trees. Better understanding of the value of the organic manures appears to be desirable, therefore, not only to prevent costs from becoming prohibitive, but to prevent many growers incurring unnecessary expense.

The organic products mostly sought are sheep, fowl, horse and cow manures, with much smaller quantities of sewage sludge and citrus peel from juice plants, etc. All these products contain many nutrients of some value to citrus trees, but the actual nutrient is much lower than many growers realise—as shown approximately in the accompanying table.

Composition of Organic Manures.

The principal nutrient in each product is nitrogen, but the content is most variable, due to variation in the quantity originally present, the quality of the food available to the animal and the length of time and conditions of exposure of the product to the air. Other nutrients such as phosphates, potash, lime and other minerals, are likely to be present in much smaller percentages.

Table showing analysis of organic manures (samples probably of from good to average quality).

	Nitrogen	Phosphoric Acid.	Potash.	Lime.
	Per cent.	Per cent.	Per cent.	Per cent.
Sheep manure	1·06	·69	1·17	—
Fowl manure	1·47	1·94	—	2·10
Horse manure	·41	·27	·67	—
Cow manure...	·4	·20	·30	·16
Sewage sludge	3·73	1·9	·91	13·32
Citrus peel	Approximates one-third the percentage of cow manure.			

It is thus apparent that, as actual fertilisers, these products are mostly of little use in supplying citrus tree requirements. As there is no doubt about the appreciable benefits that follow applications of these products to citrus trees when grown under certain conditions, it is obvious that their value results from some other quality than their nutrient content. Recognition of that fact is necessary, and may save some growers from much expense and unnecessary labour.

Their Influence on Soil Texture.

The principal reason why these organic materials prove highly beneficial, appears to be that when applied in sufficient quantity, each is capable of improving the physical condition of the soil and thereby inducing greater permeability and retention of moisture and soluble nutrients. The conditions for growth of trees and other plant life thus being improved, better tree health results.

Instances are known, however, in which generous applications of some manures to trees have not caused an improved tree condition. The reason for this apparent failure appears to be that the organic content of the soil is already satisfactory. With the expectation of a high nutritional effect from applications of manure, some growers seriously reduce the quantity of nitrogenous fertilisers applied, thereby inducing a degree

of starvation. Californian authorities calculate that for each ton of dry organic matter in the form of sheep and cow manure applied, from 55 to 120 lb. of sulphate of ammonia are needed to ensure avoidance of temporary starvation effect, due to the wide ratio of nitrogen to carbon in most manures.

With animal manures in short supply and selling at very high prices, therefore, it is advisable to purchase and apply them only to soils in need of improvement in mechanical condition and where it is impossible to grow readily suitable bulky cover crops. Application of from 3 to 10 tons of manure per acre may be advisable—or even more if the land is very low in organic matter. Expressed in more definite terms, this means that from 20 to 60 cubic yards per acre may be used on depreciated orchards.

To Irrigate or Not to Irrigate ?

A Short Story in Pictures.

What accounts for the difference in the two pasture pictures below? Do not waste time puzzling over the answer; it is to be found in the following short story.

The pasture on the right was growing (?) only 3 feet from that on the left. They are in the same paddock, were sown with the same pasture mixture, top-dressed, limed and otherwise managed in the same way . . . . . *but* when moving the irrigation spray line a strip two or three feet wide missed being watered. It missed only one watering—the last. So the answer to the question is WATER.

These photographs were taken on Mr. Mark Goldstein's irrigated dairy farm at Gleniffer.

Maintenance of Humus Content of Orchard Soils.

THE loss of organic matter in orchard soils is accentuated by continued cultural operations and excessive aeration, and the application of such material as will maintain and if possible increase the humus content of the soil should be undertaken from the earliest years of planting.

Where available, liberal dressings of stable, cow, sheep and other animal manures will give valuable returns. The rate of application will be limited by the quantity of manure available, but dressings up to and even above 5 tons per acre will be found advantageous.

Animal manure is often greatly depreciated by the carelessness displayed around the stables and yards. The manure, in many instances, is not collected regularly and stored, but is allowed to lie about exposed to the sun and rain; the urine is also allowed to run to waste. The benefits resulting from the proper stacking of the manure and the collection and addition of the urine, will more than repay the extra trouble and expense incurred.

If the manure cannot be stacked, then the stables and yards should be cleaned regularly and the manure spread on the orchard.

A Successful Campaign.

BUNCHY TOP DISEASE OF BANANAS

Controlled by Co-operative Effort.

(*Continued from page* 577.)

H. W. EASTWOOD, H.D.A., Special Fruit Instructor.

THE banana growing industry, virtually destroyed by bunchy top disease in the period 1923-1927, has been re-established under a system of control which has been administered by the Department of Agriculture in co-operation with the Banana Growers' Federation.

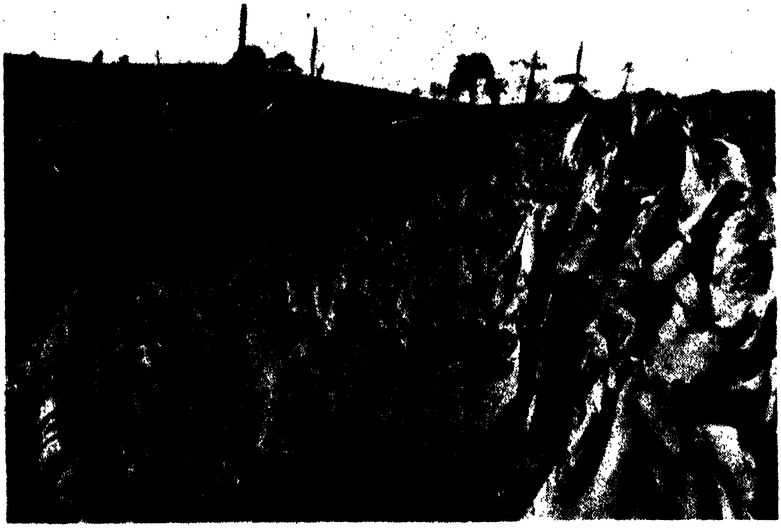
In this article, which places on record the progress of this campaign, the author has already (November issue) described the devastation wrought by the disease, traced the development of the efficient control system now in operation and indicated the measure of re-establishment that has been accomplished.

This further instalment is devoted to a more detailed account of the current control system.

The Bunchy Top Control Campaign is supervised by the senior officer of the Division of Horticulture of the Department stationed in the area, who regularly confers with the Bunchy Top Committee of the Banana Growers' Federation. This committee decides the policy so far as it effects that organization, and the administration is then carried out by departmental officers. The Banana Growers' Federation contributes up to £13,000 annually for wages and travelling expenses of men, vehicles, transportation, equipment and materials. Between forty and fifty men are employed in the work of detection. Including the cost of an intensive campaign at Yarrahappini, aimed at the eradication of the disease, the total expenditure of the Banana Growers' Federation from 1st July, 1936, to 30th June, 1946, was £92,481.

The revenue is obtained by a case contribution decided by the growers and collected as a freight charge by the Banana Growers' Federation, which transports all bananas. The contribution has increased from one penny per case in 1936 to five pence in 1946.

Departmental Inspectors direct the local operations of gangs under their control. Gangs of from three to five men including a



Bunchy Top Infested Plantation, Treated and Sprayed with Kerosene Prior to Destruction.
[*Photo. R. W. Norris.*

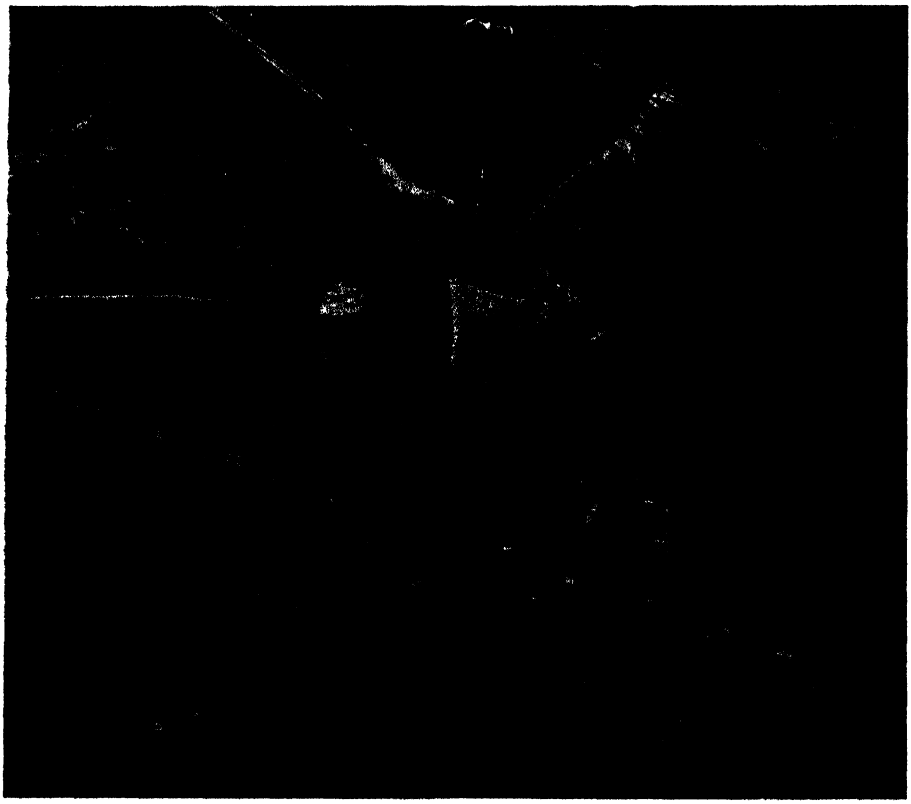
foreman are allotted to convenient areas, having regard to keeping mileage and travelling time to a minimum, and allowing for a complete inspection of all plantations within the area in a given period.

Classification of Plantations.

All plantations are classified, according to their records, into three groups, namely: (1) hot spots; (2) lightly infected; (3) very lightly infected. These are inspected three-weekly, six-weekly and three-monthly, respectively. Occasionally this procedure is varied, under special circumstances. According to the number of diseased stools found in plantations in these groups from time to time, so the plantations are transferred from one group to another. The purpose of this roster system is to concentrate on the worst-infected plantations.

Different systems of inspections have been adopted to meet varying infections of the disease, as follows:—

Leaf to leaf means the close inspection of all leaves on the plant, including the funnel leaf. One man will do 2 to 2½ acres in a nine-hour day by this method. This system is used regularly where eradication is being attempted, and sometimes where a bad outbreak of disease occurs.



The Result of Not Completely Eradicating a Stool in which Bunchy Top has Appeared.

The plant on the right shows primary infection with bunchy top contracted when, as a sucker, it had direct union with a diseased parent before the latter was removed. The plant on the left is healthy.

[*Queensland Dept. of Agriculture block.*

Stool to stool is an inspection of all plants in a stool, taking one row at a time. This system is used in plantations where outbreaks occur. One man will do 4 to 5 acres in a day.

Close survey is to inspect all stools, taking two rows at a time, and is the normal system in operation. One man will do 7 to 8 acres in a day.

Survey is to inspect four rows at a time and is used only where the disease record of the plantation is good. One man can do 10 to 12 acres in a day by this method.

Wide survey is to inspect six rows at a time, but this method is used only occasionally. One man can do about 16 acres a day.

Spotting is a random inspection of the plantation and is very seldom used in the scheme.

Treatment of Plants.

When a diseased stool is found in a plantation the foreman checks and counts the number of diseased leaves in each infected plant, and this information is recorded in his field notebook; also whether the infection is primary or secondary bunchy top. The whole of the infected stool is then thoroughly sprayed with power kerosene, using a hand atomiser pump in order to kill all aphis.

Notification to Grower.

On completion of inspection of the plantation, the foreman advises the grower, personally, if possible, of the number and position of the bunchy top stools found. Alternatively he leaves a printed notification setting out the number of diseased stools found, with a diagram of their position in the plantation on the back of the form. This form, worded as follows:—

[NOTIFICATION TO GROWER.]

GROWER'S COPY.

To.....................

....

Date.................

This will serve to advise you that an inspection of your plantation was made to-day.

BUNCHY TOP found..................
Situated as diagram on back.

....

FOREMAN.

is usually left in a conspicuous place in the packing shed. If considered advisable, the grower is notified by letter by the Departmental Inspector as well. The grower is obliged to effect the necessary eradication of all diseased stools promptly and efficiently. Instances of any "faulty eradications" are recorded and suitable action is taken against the grower concerned.

Records.

From the field note book the foreman transfers details of the daily work to his weekly report book in quadruplicate.

At the end of the working week the foreman reports to the departmental Inspector, the week's work is discussed and an itinerary is drawn up for the following week. The foreman's report is checked and certified by the Inspector and then forwarded to the Banana Growers' Federation. One copy is filed by the senior officer of the Division of Horticulture, another by the Inspector in charge of the gang, and the third copy is retained by the foreman. The totals from the foremen's weekly reports in respect to acres inspected and bunchy top found are transferred to another sheet. From these records monthly totals of acreage inspected and bunchy top found in each district are compiled and transferred on to district and State graphs. Annual statistics are also compiled from these records and made available to the industry.

Bunchy Top Infected Stool, after Spraying and Treating with Kerosene, Before Digging Out and Cutting Up.
[Photo. R. W. Norris.

Individual record cards are kept for each grower and inspections transferred from weekly report sheets to these cards and the bunchy top position in any plantation can be seen at a glance.

A roster of inspections is also kept in tabulated form so that no plantation will be overlooked in its turn for inspections.

The Digging-out Fund.

A most useful adjunct to the Bunchy Top Control Campaign Scheme has been the judicious application of a Special Disease Control Fund of £1,000, established conjointly by the Department and the Banana Growers' Federation during 1936. This society has carried on this fund beyond the original amount, and up to the present £1,651 has been spent from it.

Stool Not Desuckered.
This makes it difficult to detect bunchy top disease.
[*Photo. R. W. Norris.*

The purpose of this fund is to enable the prompt and efficient destruction of diseased plantations which are a menace, but which the grower is unwilling or unable to destroy himself, for financial or other reasons.

Each case is considered on its merits by the Bunchy Top Committee (comprised of departmental officers and directors of the Banana Growers' Federation) and this committee decides whether the cost of destruction shall be recovered from the grower, or remain as a charge against the industry. Where growers fail to meet their obligations in recoverable cases, legal action is taken to effect recovery of outstanding debts.

The work of eradication is handled by the Department by contract or day labour, subject to ministerial authority being granted, and all payments for work done are made from an Advance Account operated by the Department and all monies received credited to this account. Expenditure from the fund was particularly heavy during the low price period in 1936 and then decreased in subsequent years till 1942, as shown in the following table:—

YEAR	ACREAGE DESTROYED	AMOUNT SPENT £ s. d.
1936	134	759 0 6
1937	74	254 2 0
1938	60	201 15 0
1939	58	222 2 0
1940	18	78 1 6
1941	9	33 4 0
1942	24	102 15 0
TOTAL	377	1,651 0 0

Since 1942 there has been no need to operate this fund, but it is available if required in future.

(*To be concluded.*)

Trials with Summer Lettuce in the Batlow District.

IN co-operation with the Batlow Co-operative Packing House Limited, the Division of Plant Industry of the Department of Agriculture proposes to conduct trials this summer with the object of determining whether summer lettuce can be grown successfully in the Batlow district for marketing during the summer months in Sydney and inland districts.

Experience has shown, states Mr. A. C. Orman, Special Agricultural Instructor of the Department, that summer lettuce are usually in very short supply during the months of December, January and February, owing to the fact that the conditions under which they are normally grown are not suitable for optimum production. It is considered, however, that summer lettuce could be grown very successfully under irrigation in districts having a high altitude, provided facilities are available for the extraction of the field heat by cold storage prior to despatch to market. The Batlow Packing House has these facilities, and therefore should be in a position to place good quality summer lettuce on the Sydney and country markets, despite the long distance of transport.

VINE FERTILISER TRIALS AT GRIFFITH.

Value of Complete Fertilisers.

H. L. MANUEL, R.D.A., Viticultural Expert.

FOR some years the Department has conducted experiments at Griffith, in order to ascertain whether increased yields from grape vines under irrigation could be obtained by application of one or more particular manures. Unfortunately, work of a comprehensive nature could not be undertaken. This was due largely to the difficulty of obtaining suitable areas of vines, and to the reluctance of growers to be inconvienced—particularly at picking time, when separate handling of the grapes from the differently fertilised vines became necessary.

This article records the results obtained with two varieties in recent years.

To simplify matters as far as possible for the growers who co-operated by allowing certain of their areas to be used, plots were established by using whole rows of vines with a single or buffer row separating each plot. In this way, the separately-manured rows encroached only half-way across the land towards the buffer rows.

The grapes grown on each plot were picked separately into tins, several of which were weighed and averaged in order to establish with reasonable accuracy a total weight from each plot. All results were converted to represent the crops produced by the various treatments on an acre basis.

Farm 78 Experiments.

On Farm 78 at Griffith, two sets of plots were used:—

1. With soil of a sandy loam nature growing White Shiraz (White Hermitage) vines; and

2. With soil a little heavier, growing Black Shiraz vines.

White Shiraz Plots.—The set or block of White Shiraz contained five plots each of 1/5th of an acre, set out as follow:—

(*a*) Check plot (not treated).

(*b*) Sulphate of ammonia, 2 cwt. per acre.

(*c*) Superphosphate, 4 cwt. per acre.

(*d*) Superphosphate 2 cwt., sulphate of ammonia 1 cwt., and sulphate of potash 1 cwt. per acre.

(*e*) Sulphate of potash, 1 cwt. per acre.

In 1940 the potash rate was doubled, increasing the dressings from 1 to 2 cwt. per acre.

The average of yield for White Shiraz over a period of eight years, 1939-1946 inclusive, on an acre basis is shown below:—

Plot.	*Tons.*	*Cwt.*	*Qrs.*	*Lb.*
a	7	0	3	16
b	7	3	0	4
c	7	13	1	27
d	8	4	0	3
e	8	6	1	2

Black Shiraz.—The plots containing Black Shiraz which are ⅓ of an acre each were fertilised as follow:—

A. Superphosphate, 4 cwt. per acre.

B. Sulphate of ammonia, 2 cwt. per acre.

C. Nitrate of soda, 2 cwt. per acre.

D. Superphosphate 2 cwt., sulphate of ammonia 1 cwt. sulphate of potash 2 cwt. per acre.

E. Sulphate of potash, 2 cwt. per acre.

F. Superphosphate, 4 cwt. per acre.

G. Check (not treated).

H. Blood and bone, 4 cwt. per acre.

The average yield over the eight years, 1939-1946 inclusive, on the acre basis was:—

Plot.	*Tons.*	*Cwt.*	*Qrs.*	*Lb.*
A	4	19	3	5
B	5	8	3	9
C	5	14	0	2
D	5	18	0	12
E	6	10	0	8
F	5	19	3	24
G	5	17	3	8
H	5	15	1	1

Comments.—It will be seen that the results from this block do not match those from the plots of the White Shiraz block.

The no-manure plot G, shows an increase over plots A, B, C and H. Again, A and F, which are both superphosphate-treated plots, differ to a large degree. It is difficult to account for this variation, unless it is because the vines in the Black Shiraz plots were not as even as those in the White Shiraz.

Farm 1131 Experiments.

For a period of five years, 1940-1944, the following trials were carried out on Farm 1131.

The vines under trial were Black Shiraz variety, the soil was heavier than that of the previously mentioned plots, and each plot in use covered an area of 1/8th of an acre.

A. Superphosphate, 2 cwt. per acre.

B. Check plot (not treated).

C. Superphosphate, 2 cwt. per acre with green crop of tick beans sown at the rate of 120 lb. per acre.

D. Superphosphate, 2 cwt. per acre with green crop of wheat sown at the rate of 120 lb. per acre.

E. Superphosphate, 2 cwt. per acre with green crop of field peas sown at rate of 80 lb. per acre.

F. Superphosphate, 2 cwt. per acre with green crop of vetches sown at the rate of 80 lb. per acre.

G. Sulphate of ammonia, 2 cwt. per acre.

H. Nitrate of soda, 2 cwt. per acre.

I. Muriate of potash, 2 cwt. per acre.

J. Superphosphate 2 cwt. per acre, sulphate of potash 2 cwt. and sulphate of ammonia 1 cwt. per acre.

K. Superphosphate 2 cwt. per acre, sulphate of potash 2 cwt. and tick beans as green crop 120 lb. per acre.

L. Sheep manure, 6 tons per acre.

M. Superphosphate, 2 cwt. per acre.

N. Check plot (not treated).

O. Sulphate of ammonia, 2 cwt. per acre.

P. Blood and bone, 4 cwt. per acre.

Q. Sulphate of potash, 2 cwt. per acre.

R. Superphosphate 2 cwt. per acre, sulphate of potash 2 cwt. and sulphate of ammonia 1 cwt. per acre.

S. Sheep manure, 6 tons per acre.

The average annual yields over the five-year period, 1940-1944, were:—

Plot.	*Tons.*	*Cwt.*	*Qrs.*	*Lb.*
A	3	7	2	19
B	3	1	0	13
C	3	14	1	10
D	3	0	2	1
E	3	16	2	14
F	4	7	2	15
G	3	17	2	8
H	3	10	0	14
I	3	8	1	26
J	5	0	1	7
K	4	13	1	15
L	4	15	0	7
M	3	5	1	19
N	3	4	1	20
O	3	10	0	8
P	3	8	0	8
Q	3	15	2	11
R	5	14	2	5
S	5	8	1	27

Comment.—On this farm, the yields from plots treated with potash do not show up to the same advantage as those from the plots on Farm 78. A possible explanation may lie in the heavier soil. Plots J, K, L, R and S gave the most outstanding results —these having been treated with the more complete type of fertiliser and sheep manure. It is unfortunate, in the light of these increased yields, that sheep manure cannot be procured in large quantity.

Summary.

Generally speaking, potash does give the striking results obtained by its application in other parts of the world. However, the soils most likely to be deficient in potash are sands and light sandy loams; the trials on Farm 78 appear to bear out this contention. On the heavy soils, the same response from use of potash was not to be expected.

It would appear from these trials that what is known as a complete fertiliser may be used to advantage where vines are grown under irrigation on the Murrumbidgee Irrigation Area, though it is realised that further experimental work with fertilisers will throw more light on this subject.

PLANT DISEASES

DISEASES OF BARLEY.

F. C. BUTLER, B.Sc.Agr., Assistant Plant Pathologist.

ALTHOUGH the area sown to barley in New South Wales is small, there has been a general tendency for its cultivation to increase during the last ten years.

The crop is subject to attack by a number of diseases, the most important of which are Foot-rot, Net Blotch and Scald. In this article, all diseases of barley which have been recorded in New South Wales are described and details of the recommended control measures are given.

Foot-rot.

This troublesome disease is associated with the presence of a number of soil-inhabiting fungi, particularly species of *Helminthosporium* and *Fusarium*, which are capable of infecting the roots and the stem bases of barley plants at any stage of their growth.

Foot-rot causes losses through pre-emergence and seedling blights, which result in reduced stands, and through reducing the yield of plants, which, though infected, manage to survive to maturity.

Infected plants are stunted, with poorly developed root and tiller systems, and often show brown, tobacco-coloured markings in the form of spots, streaks or a general discolouration on the butts. The heads are frequently bleached and empty or, if grain is produced it is invariably pinched.

The development of the disease is influenced greatly by weather conditions and cultural practices. Under our conditions, there is evidence that the disease is favoured by:—

1. Continuous cropping with barley.

2. The sowing of barley after wheat, or on erstwhile grass or pasture land.

3. High soil temperatures and a high soil moisture content.

4. Feeding off, which appears to check plant growth in such a manner as to render the crop more susceptible to the disease.

Fig. 1.—Foot-rot.
Note varying degrees of stunted growth of the three plants on the right compared with healthy plant on left. Note also lack of colour, poorly developed root systems, and partial retention of heads within the leaf sheaths of affected plants.

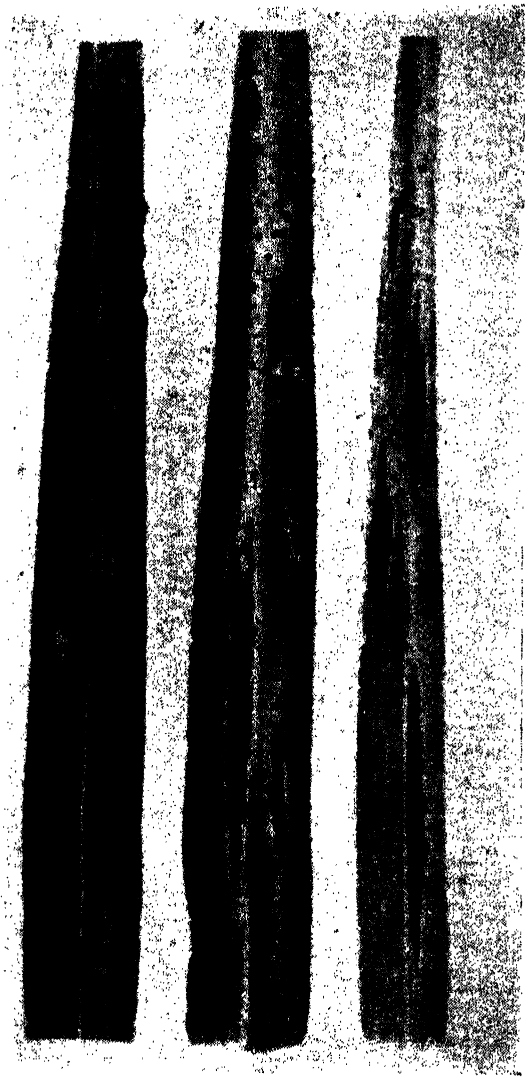


Fig. 2.—Net Blotch.
Note small and larger, elongate, dark blotches, some showing "netting" effect.

5. Frost injury, which facilitates the entrance of the causal organisms.

Control.

The adoption of the following practices may be expected to minimise losses from the disease:—

1. Keep down grasses and volunteer plants by practising bare fallow cultivation.
2. Avoid continuous cropping of land to barley and introduce oats, which are resistant to foot-rot, into the rotation.
3. Sow oats, where practicable, as a first crop on new land.
4. Prepare the land well and apply superphosphate.
5. Sow only sound, plump grain, free from discolouration at the tip.
6. Avoid feeding-off barley crops grown for grain.
7. Sow after danger from frost injury has passed.

Net Blotch.

Net blotch is caused by the parasitic fungus, *Pyrenophora teres* (=*Helminthosporium teres*), and, like foot-rot and scald, is a barley disease of major economic importance in this State.

It is characterised by a "netting" effect in the brown, more or less elongate blotches which occur on the leaves. To a lesser degree, "netting" also appears on the leaf sheaths, glumes, spikelets and grains.

The blotches may appear first on seedling leaves and, as new leaves are formed, infection spreads throughout the crop.

Control.

The causal organism may carry over on infected grain or on old stubble. For this reason, the following control measures are recommended:—

1. Introduce a crop such as oats into the rotation so that barley will not follow barley.
2. Plough deeply to bury infected stubble.
3. Treat the seed with an organic mercury dust at the rate of 2 oz. per bushel.

Scald.

Scald, caused by the parasitic fungus, *Rhyncosporium secalis,* is a barley disease of major economic importance in New South Wales.

Infection is confined chiefly to the leaves, although the leaf sheaths are also frequently attacked. Early symptoms are a somewhat water-soaked appearance and the development of dark bluish-grey colour in the affected area. Later, the lesions assume a light-grey colour and are characteristically surrounded by a dark-brown border. Individual lesions also have a distinctive shape, being widest in the central region and tapering towards each end. Frequently, too, the

diseased areas show somewhat irregular, concentric, brown rings which represent the outer border of successive enlargements of the lesions.

Fig. 3. · Scald.
Note distinctive form of the light grey lesions, surrounded by dark borders.

Under conditions of severe infection, adjoining lesions coalesce, defoliation occurs and the general impression is one of scalding.

The fungus is capable of infecting both seedlings and mature plants, and the results of infection are leaf browning, defoliation, general weakening of the plant and the production of shrivelled grain.

Seasonal carry over of the disease is on volunteer barley plants, certain naturally occurring grasses and old infected stubble and straw.

Control.

Some measure of control can be obtained by sound cultural practices such as the destruction of out-of-season barley plants and the adoption of crop rotations.

Loose Smut.

Loose smut, caused by the parasitic fungus *Ustilago nuda*, is characterised by the

Fig. 4.—Loose Smut.
Barley heads replaced by loose, black mass of smut spores.

replacement of the heads of infected plants by a loose mass of black spores. The disease is readily observable only at heading time before the powdery smut mass is removed by wind or water action, leaving only the bare central stalk of the head.

Infection takes place in the flowering stage, when the fungus enters the seed and lies dormant until the planting season. The use of infected seed results in the development of smutted heads when the plant matures.

Control.

Because the organism is primarily contained within the seed in the form of fine threads, dusting of the seed is not satisfactory. If loose smut is present, new sources

Fig. 5.—Covered Smut.
Barley heads replaced by black, smut mass which is enclosed within thin, greyish membrane.

of seed barley should be obtained, either from the Department's Experiment Farms or other reliable sources.

Covered Smut.

Covered smut, caused by *Ustilago hordei*, is quite distinct from loose smut and is characterised by a replacement of the grain and glumes by a black smut mass, which, however, remains enclosed within a thin, greyish membrane.

Infected heads either do not fully emerge from the boot or are borne on short stalks. They appear later than healthy heads.

Ordinarily, the smut mass is rather hard, difficult to rub off and remains within the enclosing membrane until broken in threshing, when smut spores are scattered over healthy seed. When infected seed is sown, the adhering smut spores germinate at the same time as the grain. The smut fungus enters the tissue of the young plant and, developing with the plant, ultimately replaces the head with a mass of smut spores.

Control.

Either of the following two treatments may be used:—

1. Formalin treatment: Place the grain on a tarpaulin or clean floor, and while shovelling, sprinkle with formalin (1 lb. formalin to 40 gallons water) until the grain is uniformly moistened. Approximately ½ gallon of solution will be required per bushel of seed. While wet, the grain should be covered for four to five hours with wet bags or canvas. It should then be thoroughly dried and bagged in clean bags to prevent re-infection and sown as soon as possible after treatment.

2. Organic mercury dusts: Dust the grain uniformly with "Ceresan" or "Agrosan," at the rate of 2 oz. per bushel. Care should be exercised in the use of these dusts as they are poisonous.

Stripe.

Barley stripe, caused by the parasitic fungus, *Helminthosporium gramineum*, is most prevalent in coastal-grown crops.

The disease is characterised by the appearance of longitudinal stripes on the leaves. These may occur as pale, straw-coloured stripes on seedlings or as more conspicuous dark-brown stripes on the leaves of older plants. The "stripe" condition is followed by a general browning of the leaf tissue, which frequently splits, giving the leaves a shredded appearance. The leaf sheaths and stem nodes may also be attacked.

Fig. 6.—Barley Affected With "Stripe."
Note the shedding of the leaves.
[After Stackman and Rodenhiser.

Frequently, infected plants die prematurely—those which survive are usually stunted and produce small, greyish-brown heads. Some ears fail completely to emerge, others emerge or partially emerge, but invariably contain either no grain at all, or grain which is pinched and shrivelled.

Although the disease is spread in the field by wind-blown spores, the initial attack is usually associated with the use of infected seed.

When infected seed is sown, the fungus penetrates the young barley shoot and infects successive leaves as they are produced by the plant.

Control.

1. Sow seed from a disease-free crop.

2. If the seed is not known to be free of the disease, dust with an organic mercury dust at the rate of 2 oz. per bushel.

Leaf Spot.

Leaf spot is caused by the fungus, *Septoria passerinii,* which attacks the leaves, producing yellowish-brown lesions.

If the attack is severe, the lesions frequently coalesce and involve large leaf areas. Within the lesions, numerous small, scattered black dots, representing the fungal spore cases, appear. Severely infected leaves are killed.

Septoria infection weakens the plant, which, as a result, frequently produces pinched and shrivelled grain.

Control.

Although seed treatment with an organic mercury dust at the rate of 2 oz. per bushel should be carried out as a routine measure, the best control results will be obtained by practising crop rotation with wheat and oats, which are both resistant to the particular species of *Septoria* found on barley.

Stem Rust.

Stem rust of barley is caused by *Puccinia graminis tritici,* which also causes stem rust of wheat and rye.

The disease is characterised in the early stages of infection by the appearance of small, somewhat elongated, reddish-yellow spots, which later develop into larger, reddish-brown pustules. In these pustules, numerous spores, which serve to spread the disease, are formed. As the season advances and the plants mature, the colour of the pustules changes from reddish-brown to black.

The disease carries over from season to season in the red-spore stage, either on out-of-season wheat and barley plants or on susceptible grasses.

Control.

Fallowing and the use of superphosphate, which give the plants a good start and tend to hasten maturity, may assist a crop to escape serious damage.

The common barberry (*Berberis vulgaris*) is susceptible to stem rust of barley and wheat, and should be destroyed, whereever present.

The best method of controlling stem rust is to grow varieties which are resistant to the disease. Unfortunately, the majority of varieties grown on a commercial scale are susceptible, although work on the production of resistant varieties suitable for New South Wales conditions is in progress.

Leaf Rust.

Leaf rust of barley is caused by the parasitic fungus, *Puccinia anomala.*

The disease appears on the leaves as small, more or less oval, yellowish spots. This infection, representing the summer stage of the disease, may take place on both upper and lower leaf surfaces, and the leaf sheath may also be attacked. Later, black winter spores are formed in greyish pustules which may or may not rupture the surface of the plant, although they frequently run together to form elongated lesions.

The disease is not serious in inland areas, but frequently heavily attacks barley crops grown for green feed in the coastal regions of New South Wales. Leaf rust infection is usually heaviest as the plants approach maturity.

Control.

The most satisfactory way of controlling any of the rust diseases of cereals is to grow resistant varieties. In the case of barley, none of the commercially grown varieties is leaf rust resistant. In the absence of suitable resistant varieties, no specific recommendations, apart from keeping down

volunteer barley plants, can be made for the control of this disease.

Powdery Mildew.

Powdery mildew is caused by the parasitic fungus, *Erysiphe graminis hordei.*

This disease is favoured by moist, warm conditions, and is usually found in rankly growing crops.

It is characterised by the appearance of white or pinkish-white masses of fungous growth on the leaves and, less frequently, on the stems. These produce large numbers of spores which are scattered by wind and rain to neighbouring plants. Later, the mould-like growth becomes reddish-grey in appearance and severely attacked leaves wither and die.

As the season advances, infected leaves become dotted with small black bodies which represent the winter spore cases of the fungus.

The fungus overwinters on old stubble and straw, and with the advent of warm, moist weather, initiates infection the following season.

Control.

Control measures are rarely necessary with this disease, but if the infected crop is heavy and rank it should be fed off.

Rotation with wheat, oats, pasture or fallow, will also assist in controlling powdery mildew of barley.

Take-all.

This disease, caused by the parasitic fungus, *Ophiobolus graminis,* usually makes its appearance in patches of varying size throughout the crop.

Diseased plants appear stunted and exhibit reduced tillering and premature ripening of the heads. The basal portions of affected plants are usually discoloured, the root system is invariably rotted and the basal internodes frequently present a freckled appearance. Adhering to the straw at the base of infected plants, there is usually found an incrustation or plate of fungus threads.

Control.

The take-all fungus lives over on infected plant residue in the soil or on certain naturally occurring grasses. The disease is best controlled by the adoption of sound cultural practices. These include:—

1. The use of crop rotations in which a resistant crop, such as oats, is included. Other suitable change crops are rape and field peas.

2. Bare fallowing. This aims at starving out the fungus by destroying such susceptible hosts as barley, spear and brome grasses.

3. Sowing varieties at the correct time and the use of superphosphate.

Bacterial Blight.

This disease is caused by a bacterial organism known as *Xanthomonas translucens hordei.*

Infection is largely restricted to the leaves, but culms and heads may also be attacked. The first signs of infection are small, water-soaked areas on the leaves. Later, these areas enlarge to yellowish or brownish, somewhat translucent blotches. On the lesions, small grey drops of bacterial exudate may appear.

The principal means of carry over of the disease is on infected grain.

Control.

Because the disease is seed borne, only seed from disease-free crops should be sown.

Approved Vegetable Seed—December, 1946.

CONDITIONS under which names and addresses of growers of seed of recommended varieties of vegetables will be listed, as hereunder, in *The Agricultural Gazette* were published in the November issue.

Further details of these new conditions, together with application forms, are available to seed growers from the Chief, Division of Plant Industry, Department of Agriculture, Box 36A G.P.O., Sydney.

Varieties Listed for December.

Cauliflower—

Shorts—H. Burton Bradley, Sherwood Farm, Moorland.

Five Months—E. A. Sharp, 110 Gordon-avenue, Hamilton.

INSECT PESTS
Notes contributed by the Entomological branch

PESTS OF SILVER BEET.

AMONGST the pests in New South Wales that attack silver beet (*Beta vulgaris*), **often referred to as spinach, spinach beet or chard, are cutworms** (*Noctuidae*), **the beet web-worm** (*Hymenia recurvalis*), **the vegetable weevil** (*Listroderes obliquus*), **aphids** (*Myzus persicae*), **the green vegetable bug** (*Nezara viridula*), **and, in some seasons, the Rutherglen bug** (*Nysius vinitor*).

Mites that may attack the plants include two species of red-legged earth mites (*Penthaleus major* **and** *Halotydeus destructor*), **red spider** (*Tetranychus urticae*), **and the tarsonemid mite** (*Tarsonemus latus*). **Snails and slugs** (*Helix aspersa* **and** *Limax sp.*) **may also cause damage.**

Cutworms.

Cutworms, which are the larvae of several species of moths, usually hide in the soil during the day and feed on the plants at night. When fully-fed, the cutworms, which may then measure about 1½ inch in length, make their way down into the soil where they enter their pupal or chrysalis stage.

The adults are mostly dull-coloured moths and are often attracted to lights at night.

These caterpillars feed upon a wide variety of plants, so that where ground is covered with weeds it is likely to be infested with cutworms, and when the ground is planted out in such areas, the young plants are likely to be eaten through or cut off at ground level.

Control.

As a precautionary measure, ground that has been cleared should be baited after an interval of two or three days with a poison bait.

Where the plants are attacked later, during growth, the bait is best scattered along the rows of plants. The baits are best distributed late in the afternoon so as to remain fresh overnight.

A Paris green and bran bait is recommended, but as bran is in short supply an alternative bait of poisoned foliage is suggested for their control.

The poisoned foliage bait is made from chopped leaves of waste lettuce, turnips, marsh mallows, etc., which have been either sprayed or dusted with lead arsenate.

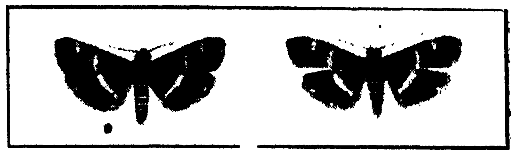
The bran bait consists of:—

Bran	24 lb.
Paris green	1 lb.
Salt	½ lb.
Water	2½ gal.

To prepare the bait, the bran and Paris green should be thoroughly mixed first, and then made into a crumbly mash with the water in which the salt has been dissolved.

The Beet Web-worm.

The caterpillars of the beet web-worm, in most seasons, cause little damage to cultivated crops, and in the Sydney district appear to prefer the common weeds *Amaranthus* and *Chenopodium*. Amongst other



Adults of the Beet Web-worm.

plants that may be attacked are beetroot, maize, saltbush and *Portulaca oleracea*.

The adult moth, which measures slightly less than 1 inch across the outspread wings,

is of a general brown colour, with two incomplete white bands on the forewings and one complete band across the hindwings.

The minute flattened eggs, which are laid in small groups, hatch in about three to five days and the caterpillars become fully-fed in about two weeks.

The fully-fed caterpillars, which may measure up to ¾ inch in length, are green in colour, and they feed on the undersurfaces of the leaves which are webbed together to form a shelter. They leave the plants and make their way down into the soil for a short distance, and there spin silk-lined cocoons covered with earth. Within these they change into pupae or chryalides and from these the moths emerge after about fifteen days. The complete life cycle from egg to adult occupies about thirty days.

Control.

In areas where infested weeds are growing adjacent to plots containing silver beet, clean cultivation should materially reduce the chance of infestation.

A dust consisting of derris 1 lb., mixed with kaolin or talc 8 lb., has been found effective in destroying the caterpillars. The dust should be directed as far as possible on the to undersurfaces of the leaves and into the hearts of the plants, and is best applied with some type of dust gun or knapsack duster. Where heavy infestations occur, applications of the dust at weekly intervals will prevent losses. Dusting has been found to be more effective when the plants are dry and not wet with dew. The rate of application is about 50 lb. per acre.

Lead arsenate dusts or sprays may be used while the plants are very young, but *must not be used on the older plants,* as the resulting arsenical residues would render the leaves unfit for human consumption, and any consignment found to be carrying such residues will be condemned at the markets.

The Vegetable Weevil.

Both the legless larvae and adult weevils may attack the plants. In their adult stage the weevils only feed at night, and shelter during the day in the ground or under rubbish about the bases of the plants. The larvae feed mainly at night and shelter by day, but may also feed during the day.

The adult, which measures about 1/3 inch in length, is greyish-brown, and has its head produced forward into a snout. The larvae are stout-bodied, legless grubs which measure up to ½ inch in length. When fully-fed they make their way down into the soil for a short distance and there construct small earthen cells, within which they change into their pupal or chrysalis stage.

The adults, which are most numerous during October and November, remain inactive in the soil during summer. The eggs are laid on the ground at the base of the plants or on the plants during the autumn and throughout the winter. The larvae occur during the cooler months of the year.

Control.

Clean cultivation is an important factor in the control of this pest, as the weevils and their larvae also feed upon numbers of weeds and a wide variety of other vegetable crops. The area to be planted out, therefore, should be treated first, as recommended for cutworms.

A poisoned foliage bait, or poisoned bran bait, as recommended for use against cutworms, will effectively control this pest.

Where young plants are attacked, both larvae and adults may be controlled by dusting or spraying with lead arsenate. The dust consists of a mixture of:—

Lead arsenate powder ..	1 lb.
Kaolin or talc.	4 lb.

The spray:—

Lead arsenate powder ..	4 oz.
Water	5 gal.

This dust or spray must not be used on the older plants as the leaves will be contaminated with arsenical residues.

As this pest does not attack peas, beans, pumpkins, etc., or oats, wheat and barley, these crops may be grown in rotation to free the ground of weevils.

Aphids.

The small, green aphids that attack silver beet, occur most frequently on the undersurfaces of the leaves, and where they infest beet with crinkly leaves they are not readily detected. Moreover, they are not easily

washed from the leaves when being prepared for cooking or processing.

This aphid infests a very wide variety of plants belonging to other groups and has received a number of popular names such as the green peach aphid, the green cabbage aphid, etc.

Aphids feed by puncturing the plant tissues and extracting the sap, and when numerous may cause discolouration and distortion of the leaves.

Control.

Severe infestations of this aphid on silver beet do not occur regularly, and sometimes are kept in check by ladybird beetles and their larvae and the larvae of hover flies, and by various species of minute parasitic wasps. In some seasons they are killed by fungi.

They may be controlled by dusting with a mixture consisting of derris 1 lb., and kaolin or talc. 8 lb., or with a 2½ per cent. nicotine dust (nicotine sulphate 1 fluid oz., hydrated lime 1 lb.). The dusts are best applied with some type of dust gun in order to reach the undersurfaces of the leaves.

The Green Vegetable Bug.

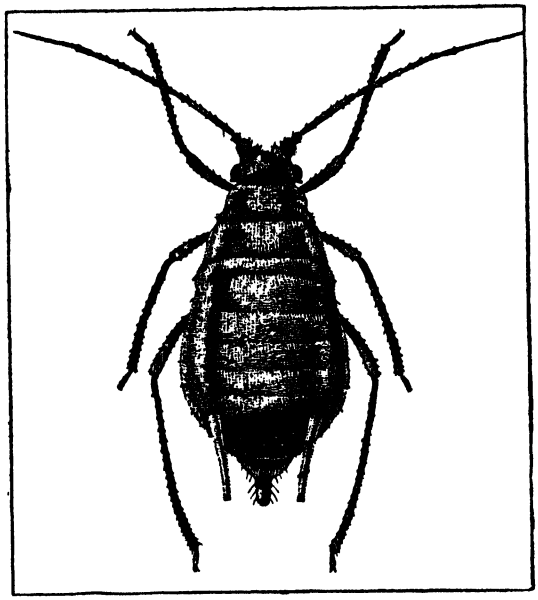
Silver beet, at times, becomes infested with this bug, and although large numbers of the adults may be present in a crop, they are not readily seen on account of their protective green colouration and their habit of frequenting the under surfaces of the leaves. As a result of the bugs puncturing and sucking the sap from the leaves, discoloured areas appear in the leaf tissues.

The bugs overwinter as adults and congregate amongst the leaves of old spent plants or in other sheltered situations. They commence to lay eggs about the middle of September and increase in numbers, becoming most abundant during February and March. The eggs are laid in clusters, each group consisting of fifty to sixty. In their immature stages the bugs are of various colours.

Control.

This pest is now mainly controlled by the introduced wasp parasite, *Microphanurus basalis*, the larvae of which develop within the eggs of the bug.

As the bugs feed upon a wide variety of plants, including weeds, and the adults may fly into and infest bug-free areas, clean cultivation and the destruction of old or spent plants, together with the bugs thereon, will help to prevent increase and reinfestation. On limited areas, infestations may be reduced by collecting the bugs and their egg clusters early in the season.



Wingless Female of the Common Green Aphid found on Silver Beet.

There is no insecticide at present available that may be used to control these bugs on silver beet.

The Rutherglen Bug.

In some seasons these bugs occur in vast numbers and become pests during midsummer.

The adult winged bugs, which measure about 1/5 inch in length, are narrow-bodied and greyish-brown in colour. In both their immature and adult stages they feed by sucking the sap from the plants.

The adult bugs are very active, and fly quickly from plant to plant when disturbed, and it is on account of this that some growers have referred to them as "small grey flies."

Control.

These bugs develop abundantly amongst weeds and various grasses during the early

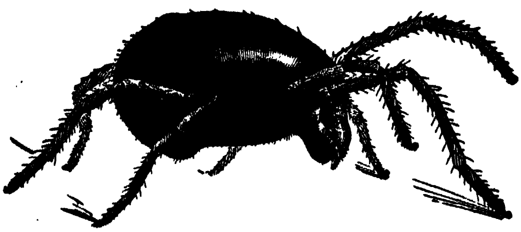
spring, and may migrate from these plants to cultivated crops. Clean cultivation during the winter, therefore, will assist in reducing later infestations.

Derris dust, 2½ per cent. nicotine dust, or a mixture of equal parts of fine tobacco dust and hydrated lime may be applied to the plants to act as temporary deterrents.

It is impossible to prevent the active winged adult bugs from entering crops from outside sources, except perhaps by means of a smoke screen from smudge fires.

Red-legged Earth Mites.

Two species of these mites occur as pests in New South Wales. One has a wide range over a large portion of the State—the Upper Hunter and North-West Slopes areas, being particularly favourable districts for its development. The other closely allied species, which is sometimes popularly referred to as the "Pea Mite," is confined to the southern sections of the State.



The Common Red-legged Earth Mite.

These mites are mainly winter pests and their damage to plants usually becomes noticeable during June and continues until September. They attack a great variety of vegetable crops in addition to silver beet, and also injure various ornamental flowers and pasture weeds.

The mites, by feeding on the plants, cause blemishes on the leaves which usually appear as silvery or greyish patches along the main veins, and where heavy infestations occur the whole leaf-surface may be injured and present a bleached appearance resembling frost injury.

The adult of the common, widespread species, which measures about 1/25th inch in length, has a purplish-blue body and a small reddish area on the upper surface of its body. Its legs and mouth parts are bright red. The majority of these mites feed during the early morning or towards sunset.

The eggs, which are laid singly, either on the leaves, on the ground, or amongst rubbish, hatch when the weather begins to become cold, but only under suitable moisture conditions.

The southern species of red-legged mite, has a velvety-black body and red legs and may be distinguished from the former species by not having the reddish area on its back.

It lays its eggs in masses, mainly on the undersides of the leaves where they come into contact with or close to the soil. These mites are to be found in groups when feeding.

Control.

Control may be obtained by spraying with a nicotine and oil spray, diluted in the following proportions:—

Nicotine sulphate ..	1½	fl. oz.
White oil emulsion ..	6	fl. oz.
Water	5	gallons.

A dust which has been found effective consists of a mixture of equal parts by weight of 2½ per cent. nicotine dust and superfine tobacco dust.

Applications of sprays or dusts containing nicotine should be made during the warmest part of the day. It is essential to spray or dust the ground below the plants as well as the plants themselves.

In experiments conducted for the control of the southern species of red-legged

Leaf Showing Damage Caused by Red-legged Earth Mites.

[*After Swan.*

earth mite,* the following poison bait has been found to be very effective and should

* Norris, K. R. 1943, Coun. Sci. Ind. Res. Bull. 171 pp. 1–28.

prove useful for the treatment for infested gardens.

The proportions of the bait used were: 9 : 6 : 2 : 1/5th, the materials and the equilvalent amounts being as follows:—

Chaff (as a carrier)	2 lb. 3 oz.
Water	1½ pints.
Sugar	10 oz.
Sodium arsenate ..	1 oz.

The bait is broadcast over the infested area at the rate of 1 lb. to approximately 200 square yards.

A dust that has controlled these mites under field conditions, and may be of special value for the treatment of infested ground before planting out, consists of a mixture of:—

Carbolic powder	1 lb.
Hydrated lime	4 lb.

The most effective time for the application of this dust would be two or three weeks after the beginning of the autumn rains.

The Red Spider.

This small mite has a wide range of food-plants and may occur upon various weeds, as well as cultivated crops and ornamental plants. It mainly infests the undersurfaces of the leaves and both feeds and spins fine webs over the surface. The leaves attacked become mottled with yellow. These mites, although referred to as "red spiders," vary in colour from yellowish to greenish-grey, with darker markings; the brick-red forms are found during the winter.

The minute eggs are laid on the underfaces of the leaves and the young forms are almost transparent. Many generations develop during the year. Hot, dry weather is favourable for their development and most damage is caused during the period from January to April.

Control.

Spraying with a lime-sulphur solution diluted at the rate of 8 fluid oz. to 5 gallons of water will control them.

Dusting with a mixture consisting of equal parts by weight of fine sulphur and hydrated lime is also effective.

A second application of spray or dust after an interval of about a week is usually necessary.

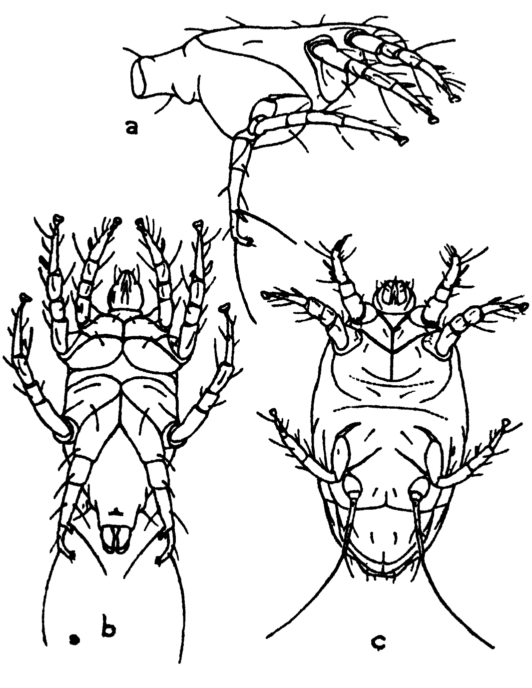
The Tarsonemid Mite.

This mite was first recorded in this State as a pest of silver beet in 1941, but it does not appear to have been recorded since.

The leaves and stalks of the plants attacked were rusty in appearance and the plants were considerably dwarfed and distorted. The rusting was particularly evident on the younger inner leaves. On account of the smallness of this mite, its presence may, at times, have been overlooked and the injury attributed to some other cause.

This mite has been recorded from many parts of the world and attacks a wide variety of plants in addition to silver beet. Amongst the plants attacked are tomatoes, beans, mangoes, figs, vines, gerberas, dahlias, begonias, etc.

The adult female mites measure slightly less than 1/100th inch in length. The males are much smaller. The eggs which measure only 1/250th inch in length are laid on the leaves.



The Tarsonemid Mite.
a.—Male side view. *b.*—Male seen from below.
c.—Female seen from below.

[*Redrawn from Terzi.*

Control.

Dusting the plants with a finely divided sulphur has been found effective in controlling this species.

Snails and Slugs.

In some localities the plants are liable to attack by snails and slugs, and for the control of these pests, poison baits containing either calcium arsenate or metaldehyde are recommended.

The formulae for the baits are as follow:—

(A) Calcium arsenate .. 1 oz.
Bran .. .. .. 1 lb.
(approximately 9 breakfast cups).
Water .. .. 1 pint.

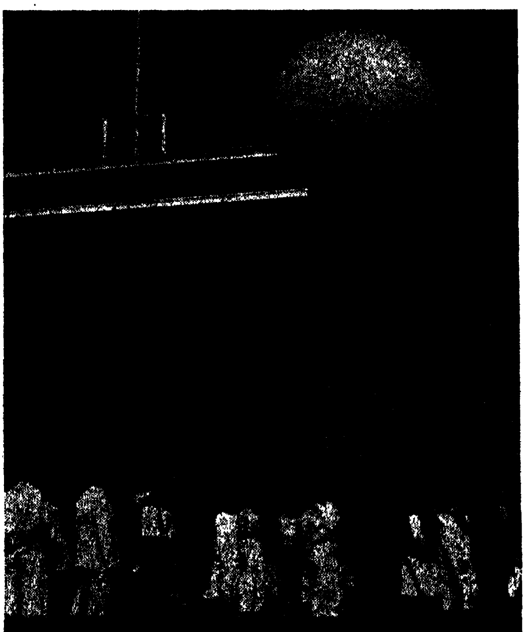
The poison and the bran (or a suitable substitute if bran is not available) are first thoroughly mixed together and then made into a mash with the water. The bait is best applied late in the afternoon or at night to ensure that it remains moist, and should be scattered lightly on the soil along the rows of plants or other places where the snails are known to congregate. It may be two or three days before the snails or slugs are killed in appreciable numbers.

The second bait recommended contains 1 to 2 per cent. of metaldehyde. The formula for the 2 per cent. mixture is approximately as follows:—

(B) Metaldehyde (finely powdered) .. 1/3 lb.
Bran .. .. .. 1 lb.
Water .. .. 1 pint.

This bait is prepared in a similar manner to that given above, and is set out in small pellets. The snails and slugs are attracted to the bait and after feeding become paralysed and die in the vicinity of it. It appears to be more effective in situations where the animals are later exposed to the sun.

Some workers overseas add 1 oz. of calcium arsenate to this bait in order to increase its killing efficiency.



Indian Meteorologists Collect Data on which to Base Weather Forecasts.

The balloon is equipped with radio apparatus for recording conditions. When it reaches a very high altitude it bursts, releasing the apparatus in a bamboo cage. A reward is offered for its return to the nearest meteorological station. About 80 per cent. of the instruments are recovered. The information collected by this means enables forecasts to be made which prove valuable to farmers.

Part of Hawkesbury College Apiary Whence the Bees were Despatched to Russia.

Apiary Notes.

W. A. GOODACRE, Senior Apiary Instructor.

Bees By Air to Russia.

THE rapid developments in fast air mail and general air transport to practically every country in the world, and the fact that bees are good air travellers, are providing opportunities to secure strains of bees for experimental breeding purposes from sources unthought of hitherto. This was amply demonstrated recently by the New South Wales Department of Agriculture in co-operation with the Commonwealth Government. A consignment of three Italian queen bees, each with an escort of young workers, was forwarded in specially prepared cages from the Hawkesbury Agricultural College to the Australian Legation in Moscow where they were safely delivered to the Scientific Institute of Bee Culture, U.S.S.R., possibly the longest air trip for bees yet attempted. The time occupied between despatch and delivery was only thirteen days.

In exchange for the queen bees the Director of the U.S.S.R. Institute will send a consignment of the Grey Caucasian variety for experimental breeding purposes under Australian conditions. It has been said that this variety will work under cooler conditions generally than other varieties of *Apis mellifica,* and this suggests that these bees may provide a valuable pollination service in orchards established in cold climates during the early spring flowering of fruit trees.

The subject of exchanging bees and bee-goods with Russia arose during a visit made by Professor Ashby—during his term as Scientific Liaison Officer, Moscow—to the Scientific Research Institute of Bee-Culture in that country. Some very interesting aspects of Professor Ashby's visit are given later in these Notes.

Type of Export Cage Used.

The selection of a type of cage to use in sending the bees to Russia was discussed with Mr. H. Graham Smith of Hawkesbury Agricultural College Apiary, and it was decided, in order to guard against possible delay in transport and the effect of extreme

climatic conditions likely to be experienced en route, to use a cage of the Strgar type.

The accompanying illustration shows the construction of the cage. The drawing shows the cage with the full length top cover completely removed and the two side flaps over the food compartments pulled out a little —to give a better view. Good firm queen candy was well pressed into the food compartments until they were about three parts full, and on top of the candy neatly fitting strips of comb foundation were inserted and fastened to the sides of the compartments, to prevent seepage. Two apertures in each division board allowed access by bees to the candy supply. These led in from the centre compartment which contained three small frames of comb to provide comfortable and natural living quarters for the queen and her escort worker bees.

Provision for Ventilation.

It was decided to forward the bees during July so that they would arrive in Russia during the active working season, and fortunately colonies active enough in brood-rearing were available when required to provide the necessary young escort workers. These were hand picked and eighty placed in each cage with a queen.

Ventilation was provided by means of a strip of wire gauze over the frames; when the cover was nailed on an air space was left right through—over the screen and food compartment flaps. In addition a screened vent was provided on each side of the centre compartment of the cage. In packing the three cages in one parcel a small air space was allowed between them so that these side vents would be freely operative.

The Hazards of the Journey.

On the first stage of their journey the caged bees were forwarded to the Department of External Affairs, Canberra, A.C.T., where they were placed in the diplomatic mail bag going forward by air to Russia. They were rather "pampered passengers" in a way, for, in addition to travelling with the special mail, they were placed in the care of a responsible officer who offered to co-operate by taking care that the bees were not subjected to any extreme conditions which could be avoided, and that they would not be exposed to fumigation.

Considering that the trip to Moscow only occupied thirteen days, it might appear that we were a little over-cautious in using the cage described with such large escorts and a food supply sufficient for six weeks or more. However, as already mentioned, it was probably the longest air trip for bees that has ever been attempted and it was necessary to guard against possible delays en route. Then again the climatic changes likely to be encountered during the journey had to be seriously considered, and this necessitated natural conditions for the bees to cluster during cold changes and yet ample room for dispersal of the escort in hot spots. Even in sending the bees from Richmond to Canberra during winter time an extreme change in temperature was likely to be encountered.

The despatch of these bees under conditions which would ensure their safe arrival involved a good deal of inquiry in regard to the air mail service, and the care of the bees during the trip.

Useful Exchanges Arranged.

In addition to bees, the exchanges arranged by Professor Ashby included literature, seeds of plants and bee-goods of mutual interest to both countries. These are being effected by the Department of Commerce and Agriculture in Melbourne, and all States of the Commonwealth have been contacted in order to make a success of the project.

Extracts from Professor Ashby's Report.

The following information is extracted from the report of Professor Ashby, who visited the Institute of Bee-Culture—a fine building in about 150 acres of ground—with Professor Alpatov, who is in charge of the Laboratory of Bee Diseases and who has the Chair of Animal Ecology in the University.

Extent of Bee Keeping.

Bee keeping is very common as a practice among members of collective farms who may keep their own hives. In addition there are, in the south of Russia and parts of Siberia, special State farms devoted to bee keeping. Some of these have as many as 10,000 hives.

Training and Extension.

The results of research in the Institute are sent to the Commissariat of Agriculture which disperses useful information through agronomists attached to collective farms, and by leaflets. In addition, at present some 3,500 students are learning bee keeping by correspondence. There are winter courses (lasting the whole winter) for winter zootechnicians (extension officers who wish to qualify for instruction in bee keeping). There are professorships of bee keeping in four agricultural colleges: Moscow, Tashkent, Omsk, Kiev. The Institute has, this year, begun a special college for bee culture, which gives a one-year course for the best graduates of universities or higher agricultural colleges.

The Departments and Their Activities.

The Institute is divided into the following departments:—Economics, Technology of Wax and Honey, Selection and Breeding, Bee Keeping, Pollination and Bee Pastures, Bee Diseases, Laboratory of Bee Behaviour, Laboratory of Ecology, Laboratory of Mechanisation, Library.

In the *Laboratory of Pollination* very interesting work is going on on the pollination of Red clover, lucerne, sunflower and other plants. Some of the more important results are as follow:—

(*a*) It has been established that there are genetic strains for nectar production, and there have been intensive studies by ingenious methods, on the rate of nectar production by individual flowers.

(*b*) A great many data have been collected on the relation between the amount of seed set in a crop (*e.g.*, clover) and the distance from the bee hive. The general shape of the curves is a logarithmic decrement, and the mean distance travelled by bees for pollination varies with temperature, sunshine, etc.

(*c*) An intensive study has been made on the tripping of Red clover and lucerne flowers. In Red clover for instance, it has been found that 34 per cent. of tripping is due to honey bees; 34 per cent. to wild bees; 8 per cent. to insects of unknown classification; zero per cent. to sunshine and 24 per cent. to other causes. In lucerne the frequency of tripping of flowers increases rapidly from 8 a.m. until about midday, drops sharply to a minimum at about 1 p.m. and rises again in the afternoon. This is correlated with the activity of bees and temperature.

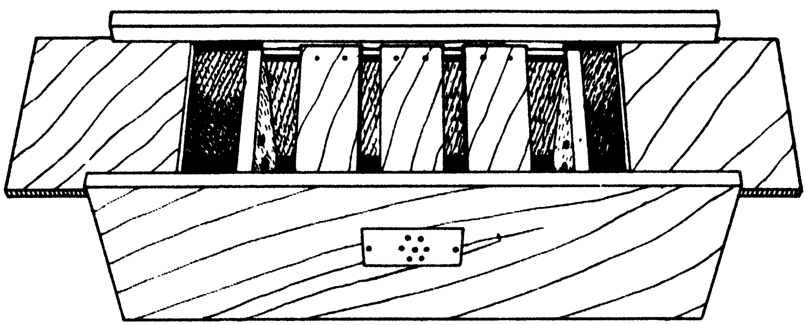


Diagram of the Cage in which Italian Queen Bees and Escorts were sent by Air Mail to Russia.

The full length top cover is not shown in order that the details of construction may be seen. Note the food chambers at the ends and the three short frames across the centre compartment

(*d*) The results of selection for nectar production have been very successful; and there has recently been selection from a very heterozygous strain of Red clover for short corolla. In 1936 there was only 0.02 per cent. of short corolla flowers; in 1938 there was 8.7 per cent. and in 1944 14 per cent.

In the *Laboratory of Bee Behaviour* extremely interesting work has been done by Gubin on the training of bees to pollinate certain flowers. The effect this training has had on seed production in the U.S.S.R. is very surprising. The method is very simple. If it is required to train bees to pollinate lucerne flowers, dishes of 50 per cent. sugar are put into the hive above the nest. In these dishes are put some lucerne flowers. The flavour from the flowers persuades the bees to go out of the hive afterwards and to pollinate lucerne almost to the exclusion of other plants. The training

takes two to three days; and the effect lasts for the whole of the flowering season.

Where seed production is important, bees are regularly trained in this way all over the Soviet Union. As soon as one crop is finished flowering and another one begins the bees are trained to the new crop. I saw figures, subject to adequate statistical analysis, which showed that the seed production in a field pollinated by trained bees was 4.2 times the seed production in a control field of the same crop pollinated by untrained bees. In addition trained bees may produce in the hive almost five times as much honey as untrained bees.

The idea behind this work is not entirely original. I was told that Von Fritsch had suggested the idea in a paper on advice for migratory bee keepers. But it seems that the method has been exploited for the first time on a large scale in the U.S.S.R. and the results certainly justify the method.

In the *Laboratory of Bee Keeping* I saw work on the artificial swarming of bees which results in the production of five swarms from one in a single season. I was also shown a very simple pollen trap which removes pollen from bees on their return to the hive and enables a large amount of pollen to be collected.

In the *Laboratory of Ecology* work is going on on selection of bees according to behaviour. Komarov has produced an intermediate between a queen and a worker.

In the *Laboratory of Selection* work is being done on the selection of bees for winter resistance, honey production and wax production.

In the *Laboratory of Technology* there is a good collection of different kinds of honey and wax. An ingenious apparatus was shown to me which measures simultaneously the hardness, plasticity, and resistance of samples of wax. Routine measurements of hardness are made with an instrument taken from the cement manufacturing trade. In this Laboratory also, work is being done on the use of waste products. These include a shoe polish made from residues not usually utilised, and the production of honey beer, which contains about 4 per cent. alcohol and which is quite palatable.

Exchange of Bees and Material.

The staff showed a very great interest in Australia and are anxious to have from Australia the following:—

Seeds of typical honey plants.

Samples of the most important kinds of bee-keeping equipment.

Model of migratory hives.

Samples of honey and wax labelled with the districts from which they have come and, if possible, with the plants from which the honey has been made.

Samples of living queens.

The Director undertook to reciprocate by sending to Australia similar material.

In particular, they have produced at this Institute a Caucasian queen which pollinates at a considerably lower temperature than Italian queens and would possibly be useful for fruit orchards in the cooler parts of Australia. It is therefore proposed that Australia and the U.S.S.R. should exchange golden Italian queens for grey Caucasian queens.

I was given publications on the training of bees for seed production, seed production in sunflowers and Red clover, samples of the bee culture bulletin, and full plans of a typically Russian hive.

In the course of discussion it also appeared that gramicidin (a sample of which has been sent to Australia already) has been used for the treatment of the disease nosema.

Agricultural Societies' Shows.

SECRETARIES are invited to forward for insertion in this list dates of their forthcoming shows; these should reach the Editor, Department of Agriculture, Box 36A, G.P.O., Sydney, not later than the 15th of the month previous to issue. Alteration of dates should be notified at once.

1947.

Queanbeyan (D. Vest) .... February 21, 22
Tumut .... March 4, 5
Newcastle (P. G. Legoe) .. February 19, 20, 21, 22
Tingellic (A. G McVean) .... March 5
Sydney R.A.S. (G. C. Somerville) Mar. 29 to Ap. 9

POULTRY NOTES.

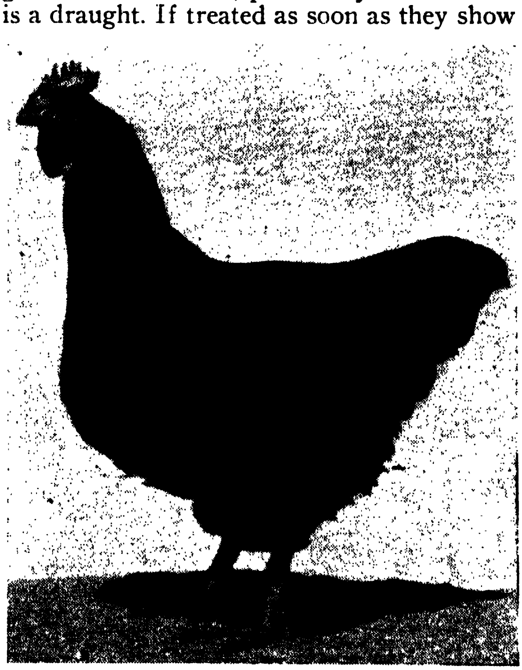
E. HADLINGTON, Poultry Expert.

Prepare for Heat Waves.

THE sudden, excessively hot weather experienced recently is a reminder that heat waves are to be expected periodically throughout the rest of the summer, and that suitable precautions should be taken to reduce losses to a minimum. Where an adequate water supply and sufficient labour are available, there is no reason why heavy losses should be experienced during normal heat waves, but failure to keep a constant watch for trouble when the temperature rises much above 100 deg. Fahr. may result in a high rate of mortality.

One of the main considerations is to ensure that the houses are well ventilated, and if doors are fitted at the back, these should be opened to allow a current of air through, particularly on humid days. Attention to the water supply is also important; the water vessels should either be placed in the houses or in close proximity so that the birds do not have to go far in the sun to get a drink, as this will quickly result in losses.

On very hot days a routine inspection of the pens should be made every hour or so, particularly from the early afternoon onwards and the birds should be disturbed to see if any are prostrate. These will lie on the floor and move only with difficulty. They should be taken from the pens, held under a tap to wet their heads and under the wings, and then placed on a wet area of ground in the shade, preferably where there is a draught. If treated as soon as they show



First Hen to Lay 200 Eggs.
Winner of "Poultry" newspaper trophy. This hen (No. 373) is owned by Devonshire Poultry Farm.

signs of distress most birds will quickly recover, but advanced cases may require

several applications of water. It is not advisable to saturate birds unless they do not respond quickly to treatment.

On excessively hot days it may be necessary to wet the floors of the houses, but if this is done where litter is on the floors and it becomes saturated, it is advisable to clean out the litter before the birds go to roost at night, particularly in humid weather when a cool change does not occur before evening, as the damp litter would create increased humidity and cause trouble.

When a heat wave is anticipated it is advisable to reduce the amount of food given to the birds, as they will suffer more from the heat if they have full crops and drink copiously during the heat of the day.

In the event of the owner having to leave the farm on very hot days, arrangements should be made for someone capable of handling birds to be left in charge, otherwise heavy losses may result.

Egg Weights in 1946-47 Egg-laying Competition at Hawkesbury Agricultural College.

THE egg weighing results at the Hawkesbury Agricultural College Egg-laying Competition should be of interest to most poultry farmers, whether they are competitors or not, as the weights in the Competition may be taken as some indication of the trend in flocks generally.

The weighings are based on the average number of eggs laid successively between 1st and 31st August, but in the case of birds which do not lay twelve eggs in that period, the weight is taken of the first twelve eggs laid from 1st August to the 31st October, and any bird other than a replacement which fails to lay twelve eggs in that time is disqualified. Where birds are replaced after 1st August, the first twelve eggs laid are weighed provided that this number is laid in ninety days, otherwise these birds are disqualified. Three hens in this category had not yet laid the requisite number of eggs by 1st November. These are indicated in the accompanying table by a dash, but the eggs are being weighed and the weights will be recorded, if eligible.

The weights this year show an improvement over last year as the comparative figures hereunder will show:—

Birds Laying Under-weight Eggs, 1946-47.

	Individuals. Per cent.	Groups. Per cent.
Light Breeds ..	25—6.9	9—15.0
Heavy Breeds ..	19—10.5	5—16.6
1945-46.		
Light Breeds ..	38—10.3	15—25.0
Heavy Breeds ..	32—18.0	10—33.0

In the current test four light-breed hens were disqualified because they failed to lay the required number of eggs during the weighing period. These are shown by the letter (b) in the accompanying list of weights; and those which failed to lay eggs averaging 24 ozs. to the dozen are indicated by (a).

AVERAGE EGG WEIGHTS.—Forty-fifth Egg-laying Competition 1946-47.

Competitor.	Individual.						Group.
	White Leghorns.						
Adler, A.	26.1	24.1	24.8	a23.5	25.5	28.1	25.4
Alder, G.	26.5	25.6	25.0	25.3	24.6	26.1	25.5
Argall, W. F.	27.1	27.9	26.3	25.0	25.2	24.0	25.9
Badman, C. R.	26.0	24.3	26.3	26.9	24.5	25.8	25.6
Baird, C. W.	26.3	25.5	25.2	26.2	26.2	24.9	25.7
Barton, J. H.	26.5	26.4	28.8	26.5	26.4	27.0	26.9
Biddle, W. R.	24.6	25.8	25.6	25.1	25.4	25.2	25.3
Bray, M. J.	24.8	26.3	25.9	24.4	25.9	25.6	25.5
Brown, M. J.	25.8	25.3	24.6	24.3	25.3	24.3	24.9
Bruce, W. H.	27.0	28.0	27.1	28.4	25.8	24.9	26.9
Cardun Pty. Farm ...	28.3	28.3	24.6	25.0	24.3	26.0	26.1
Carpenter, H. B. ...	26.1	27.5	27.1	24.9	24.1	25.8	25.9
Chidzey, H. T.	24.9	26.4	24.0	25.1	26.8	25.4	25.4
Christie, R. G. & Son ...	25.0	24.5	25.2	24.9	27.4	25.5	25.4
Clark, C. A.	24.8	29.7	28.0	25.8	26.4	28.6	27.2

a Indicates bird failed to lay eggs of 24 ozs. per doz.

AVERAGE EGG WEIGHTS.—Forty-fifth Egg-laying Competition, 1946–47—*continued.*

Competitor.	Individual.						Group.
			White Leghorns.				
Comyns, J.	25.5	24.8	*b*	28.9	26.3	24.3	*a*
Cullen, D. A.	27.8	*a*23.8	29.2	26.3	25.6	26.0	26.4
Davidson, M. S.	28.0	25.6	26.3	24.5	25.9	24.6	25.8
Devonshire Pty. Farm ...	26.8	24.1	26.2	27.4	26.8	28.1	26.6
Ellison, J. H.	26.6	25.2	26.3	26.1	25.0	25.6	25.8
English, C. E.	24.7	27.3	24.9	25.4	24.8	26.9	25.7
Evans, C. D.	27.3	24.6	24.5	26.2	25.1	25.8	25.6
Faunt, M. M.	26.8	26.0	26.8	26.3	25.3	26.2	26.2
Flew, J. L.	25.5	26.3	27.3	25.9	25.4	24.5	25.8
Gilmore, N.	27.0	*a*23.4	25.6	25.4	24.9	25.5	25.3
Graham, Miss M. ...	25.4	*a*22.9	*a*23.0	25.5	26.6	25.8	*a*24.9
Greenfield, T. E. ...	24.8	27.4	26.1	27.8	24.3	25.7	26.0
Hankinson, J.	25.9	27.4	25.5	26.1	24.3	26.4	25.9
Heathfield, J. G. ...	26.2	24.6	26.1	25.5	25.9	27.8	26.0
Heathfield, L.	*a*22.6	26.6	25.3	26.7	*a*23.4	27.2	*a*25.3
Hoe, W. H.	26.1	26.1	25.7	28.3	27.0	24.8	26.3
Holyoak, H.	26.1	24.3	26.7	27.7	24.3	27.2	26.0
Hooker, P. J.	25.5	24.5	25.2	25.2	26.0	25.3	25.3
Hudson, L. L.	24.8	27.4	26.7	27.0	25.2	26.5	26.3
Iori, E.	27.9	*b*	27.1	*a*23.1	26.8	24.4	*a*
Kennedy, F. J.	25.7	25.4	26.8	25.5	*a*23.4	*a*23.6	*a*25.1
Kerruish, J.	25.1	*b*	26.1	25.5	24.5	26.1	*a*
Knox, T. B.	26.2	*a*22.0	25.2	26.3	...	26.2	*a*
Knott, W.	24.7	27.3	28.0	28.3	25.4	26.5	26.7
Minegold Poultry Farm...	27.7	24.6	29.4	27.0	25.1	27.0	26.8
Leach, C. L. & Son ...	26.4	24.9	25.4	26.0	24.3	27.2	25.7
Martin, S....	26.5	25.6	26.9	26.1	25.0	*a*23.5	25.6
Morrin, C. W. & Son ...	24.5	24.8	*a*22.9	24.3	*a*23.2	25.7	*a*24.2
Newman, L.	24.7	25.3	26.6	25.4	26.4	25.4	25.6
Newton, R.	25.0	28.4	26.0	25.1	27.3	26.4	26.4
Orange, G. E.	26.2	25.3	24.3	26.2	25.8	26.8	25.8
Pope, J. & Son	25.6	26.5	27.6	27.7	24.5	26.7	26.4
Ranch, P. O.	25.7	24.9	25.9	25.4	24.9	28.5	25.9
Ray, F.	25.4	26.6	25.3	25.9	24.7	*a*22.7	25.1
Riddle, Mrs. I.	24.2	26.2	26.7	26.3	25.8	27.3	26.1
Hawkins, V. H.	25.9	28.1	28.6	28.2	26.8	27.4	27.5
Sergeant, S. K.	25.4	26.9	26.9	27.4	27.4	27.8	27.0
Southern, J.	25.4	26.3	*a*23.9	26.8	24.5	26.7	25.6
Thoroughgood, R. ...	26.1	*a*23.3	24.2	26.0	24.6	28.9	25.5
Watt, R. E.	27.7	27.0	27.2	26.5	27.2	27.0	27.1
Wheatley, G. H. ...	26.0	25.6	26.2	24.9	27.4	24.5	25.8
Willmott, W. T.	26.1	*a*22.9	24.5	25.0	*a*23.8	*b*	*a*
Wimbleford Pty. Farm ...	28.5	27.9	26.7	27.6	24.6	26.7	27.0
Anderson, W. and N. ...	25.3	25.5	*a*22.9	24.3	24.8	25.5	24.7
			Anconas.				
Marr, W. L.	25.1	27.5	*a*22.4	24.8	24.8	24.7	*a*24.9
			Australorps.				
Brown, W. T.	25.0	*a*23.2	25.6	25.5	25.3	26.5	25.2
Campbell & Kinnish ...	26.0	26.6	27.0	28.2	26.6	25.1	26.6
Clark, C. A.	27.1	26.8	25.2	25.6	26.2	24.2	25.9
Devonshire Pty. Farm ...	24.5	25.7	24.1	25.5	26.0	*a*23.8	24.9
Evans, C. D.	25.2	28.1	26.9	28.1	24.7	24.1	26.2
Fitzsimons, E.	26.0	*a*22.2	*a*23.0	25.1	27.4	28.7	*a*25.4
Goodridge, W. J. ...	24.9	24.2	27.3	*a*23.8	26.8	*a*22.8	*a*24.9
Greenwood, Bros. ...	26.3	26.4	—	25.4	24.5	27.5	—
Hawkins, V. H.	28.0	27.5	*a*23.5	29.8	26.8	26.8	27.1
Henderson, R. B. ...	26.0	26.6	25.2	24.5	26.2	24.6	25.5

a Indicates bird failed to lay eggs of 24 ozs. per doz.
b Indicates bird failed to lay required number of eggs during weighing period.
—Indicates bird recently replaced and had not laid twelve eggs prior to 1st November.

AVERAGE EGG WEIGHTS.—Forty-fifth Egg-laying Competition, 1946–47—*continued.*

Competitor.	Individual.						Group.
			Australorps—continued.				
Judson, N. F.	26.0	25.4	25.7	27.7	26.8	27.3	26.5
Minegold Pty. Farm ...	25.9	26.2	28.1	25.6	25.6	*a*23.8	25.9
Martin, S....	27.0	27.9	*a*22.8	24.1	26.8	24.2	25.5
McDonald, T.	24.6	27.2	28.5	28.3	25.2	26.5	26.7
Paull, R. W.	27.1	26.0	25.1	27.8	25.1	26.9	26.3
Ramsden, D. H. ...	28.3	26.3	*a*22.6	28.1	24.1	25.0	25.7
Smith, N. F.	24.8	25.5	25.2	25.6	25.8	26.0	25.5
Southern, J.	25.0	24.1	24.6	25.1	24.8	25.3	24.8
Tyson, Bros.	*a*23.5	24.0	25.6	25.5	24.5	25.1	24.7
Wright, K. E.	26.3	27.9	25.1	26.6	27.4	26.3	26.6
			Langshans.				
Harris, R. F.	28.0	26.7	25.9	26.5	26.4	26.7	26.7
Hooker, P. J.	26.4	24.8	24.8	25.2	*a*23.6	26.8	25.3
Miller, J. E.	24.9	25.8	27.5	27.3	27.9	--	—
Moyes, T. R.	27.0	28.9	26.8	28.0	26.2	26.8	27.3
Nicholls, S.	24.9	27.1	24.7	25.2	24.8	24.7	25.2
Riddle, M. G.	26.8	26.0	26.5	*a*21.4	27.5	25.8	*a*25.7
Wilson, R. D.	26.7	25.8	25.2	25.0	26.4	*a*23.1	25.4
			Rhode Island Reds.				
Finney, F. P.	26.8	24.6	26.2	26.7	24.8	27.5	26.1
Holt, T.	*a*22.3	27.6	24.8	27.7	25.6	26.8	*a*25.8
Small, R. A.	25.7	*a*23.8	*a*22.1	*a*23.2	24.2	*a*23.7	*a*23.8

a Indicates bird failed to lay eggs of 24 ozs. per dozen.
—Indicates bird recently replaced and had not laid twelve eggs prior to 1st November.

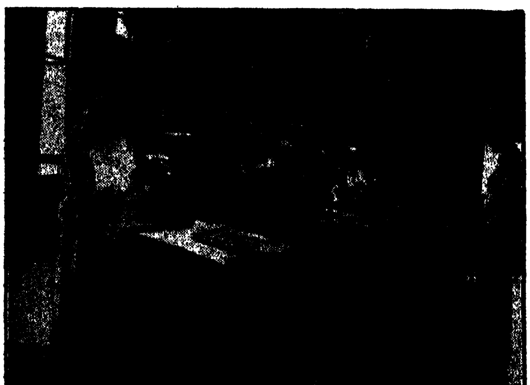
List of Qualified Chick Sexers.

DURING the 1946 season eight chick sexing examinations were conducted by the Department, and thirteen candidates qualified for Certificates—two for Special Class and eleven for First Class.

A complete list of those who have now qualified for Special and First Class Certificates, and also (in 1944 and 1945) for Second Class Certificates, is given hereunder:—

Special Class Certificates.

Mr. F. D. Evans, Leamington-street, Dundas.
Mr. S. W. Leach, Windsor-road, Baulkham Hills.
Mr. A. L. B. Newton, Adelaide, South Australia.
Mr. N. V. Davies, Garnet-road, Miranda.
Mr. O. B. Johnson, 52 Dickson-avenue, West Ryde.
Mr. R. W. Druce, Old Prospect-road, Wentworthville.
Mr. R. A. Percival, 135 Longueville-road, Lane Cove.
Mr. S. Martin, Duggan Farms, Blacktown.
Mrs. O. B. Johnson, 52 Dickson-avenue, West Ryde.
Mr. S. G. Olsson, Western-road, Wentworthville.
Miss B. B. Brown, Redleaf, Green's-avenue, Dundas.
Mr. J. Edwards, 74 Grantham-road, Seven Hills.
Mr. C. R. Sims, 5 Millar-street, Drummoyne.
Mr. H. D. Brown, Braeside-road, Wentworthville.



Chick Sexing Examination in Progress.

Mr. G. A. Lee, 60 Beaufort-street, Croydon Park.
Mr. R. G. Amies, Windemere-avenue, Northmead.
Mr. K. L. Moore, 5 Daisy-street, Chatswood.

Special Class Certificates.

Mr. A. A. Tegel, Leppington.
Mr. C. R. Badman, Mackenzie-street, Revesby.
Mr. J. R. Kilborn, 9 Denman-street, Eastwood.
Mr. E. Marchant, Melbourne, Victoria.
Mr. W. Evans, Leamington-street, Dundas.
Mrs. F. D. Evans, Leamington-street, Dundas.
Mr. C. C. Green, 82 Carlingford-road, Epping.
Miss V. Wilson, Box 249 Post Office, Newcastle.
Mr. H. Jacobs, Vimiera-road, Eastwood.
Mr. I. A. Hazlett, Ingleburn.
Mrs. A. Brakell, Church-street, Carlingford.
Mr. K. Gibson, Wensley House, Stamford Park road, Mt. Roskill, Auckland, New Zealand.
Mr. Gordon Thomson, Opoho, Dunedin, New Zealand.
Mr. A. E. Sutton, 65 Bungaree-road, Wentworthville.
Mr. J. H. Turner, Hotham-road, Sutherland.
Mrs. T. M. Brown, Main-road, Kearsley, via Cessnock.
Mr. J. Herrman, 86 Station-street, Fairfield.
Mr. H. Wallaste, Grantham-road, Plumpton.
Mr. O. Van Stappen, Pacific Highway, Wyong.
Mrs. H. M. Leach, Windsor-road, Baulkham Hills.
Mr. A. M. Smith, Richmond-road, Blacktown.
Mr. A. H. Baker, 13 Marion-street, Harris Park.
Mr. L. A. Brown, Main-road, Kearsley.
Mr. R. Pitt, Government-road, Weston.
Mr. O. Korting, Bid-a-wee Poultry Farm, Quaker's Hill.
Mr. R. O. J. Clucas, Excelsior-avenue, Castle Hill.
Mr. K. J. Fooks, Tomah-street, Carlingford.
Mrs. Z. Jacobs, Kildare-road, Doonside.
Mr. N. Long, Ferndell-street, Guildford.
Mr. R. Lockyear, Hurt-street, West Wollongong.
Mr. G. E. Mahon, Kings-road, Ingleburn.
Mr. R. J. Mayjor, 106 Ballandella-road, Toongabbie.
Mr. F. S. Wrigley, 1 Blencairn-avenue, Caulfield, S.E. 7, Melbourne.
Mr. R. Clark, Bay-road, Arcadia.
Mr. S. G. Gibson, Richmond-road, Marsden Park.
Mr. A. Pamment, 6 Fairview-street, Guildford.
Mr. B. J. Dawson, Withers-road, Kellyville.
Mr. R. Watson, 4 West Terrace, Bankstown.

Second Class Certificate.

Mrs. W. J. Hanley, 219 Princes Highway, Charlestown.

Standards for Certificates.

Particulars of the standards for the various certificates are as follows:—

For a *Special Class Certificate* it is necessary to sex 300 White Leghorn chickens in 45 minutes with 98 per cent. accuracy, without killing or injuring a chicken.

For a *First Class Certificate,* 200 White Leghorn chickens must be sexed in 30 minutes with an accuracy of 95 per cent. and not more than one chicken killed or two injured.

The *Second Class Certificate,* which has now been discontinued was introduced as a wartime measure in order to enable more sexers to qualify to meet the increased demand. The standard was the same as for First Class except that 50 minutes were allowed for sexing the 200 chickens.

Learning Chick Sexing.

Not many of those who contemplate taking up chick sexing know the difficulties involved in reaching the standard necessary to qualify for a certificate. It should be understood that, in addition to obtaining tuition in the subject, extending over several months, it is necessary to have thousands of chickens for intensive practice, and very few candidates qualify for a certificate at the first examination. Thus the cost of learning is fairly considerable. At present there are about enough sexers to meet the demand and preference is given to those holding Special Class Certificates.

The Disadvantages of Hilling Maize.

THE depth of cultivation of the growing maize crop is very important. Cultivation of the established plants must not be deep. No harm is done if deep cultivation is practised in the early stages of growth, provided it is not too close to the plants, but from when the plants are 18 to 20 inches high only shallow cultivation should be given, as, the plant being a surface feeder, the roots extend across the rows and within 3 or 4 inches of the surface.

The disadvantages of hilling outweigh the advantages, and as a general practice it cannot be recommended. A light hilling may sometimes be necessary to smother weed growth or as an aid to drainage on low-lying lands, but the damage done to roots, the possibility of "gullying" on slopes, and the greater surface exposed for evaporation are all against the practice, while the support given to the stalks by hilling is not so important as is usually thought. Throwing a big hill with the plough, as still often practised, cannot be too strongly condemned.

It is not necessary to remove the suckers from growing maize crops. This practice, adopted by many farmers with the idea of increasing yield and incidentally providing a little fodder for stock, actually decreases the yield, as proved at an experiment conducted at Grafton Experiment Farm over a period of four years.

Tubercle-free Herds.

THE following herds have been declared free of tuberculosis in accordance with the requirements of the scheme of certifying herds tubercle-free, and, unless otherwise declared, this certification remains in force until the date shown in respect of each herd :—

Owner and Address.	Number Tested.	Expiry Date.
Registered Stud Herds.		
Armstrong, K. A., "Heathfield," Boorowa ...	23	18/12/46
Berry Training Farm, Berry (A.I.S.)	129	16/10/46
Bradley, H. F., "Nardoo," Ashford Road, Inverell (Jerseys)	40	13/4/47
Campbell, L. W., "Dunmallard," Fern Hill Road, Inverell (Jerseys)	39	21/7/47
Cattell, E. J., "Kapunda," Rob Roy, Inverell (Jerseys)	121	30/6/47
Chegwidden, E., "Austral Park," Berry (Jerseys)	88	14/1/47
Christian Bros. Novitiate, Mt. St. Joseph, Minto	29	15/7/47
Coote, B. N., Auburn Vale Road, Inverell (Jerseys)	85	23/7/47
Cowra Experiment Farm (Ayrshires)... ...	56	5/7/47
Department of Education, Yanco Agricultural High School (Jerseys)	64	1/3/47
Dixon, R. C., Elwatan, Castle Hill (Jerseys)...	29	5/3/47
Fairbairn, C. P., Woomargama	173	17/3/48
Farm Home for Boys, Mittagong (A.I.S.) ...	59	2/8/48
Farrer Memorial Agricultural High School, Nemingah (A.I.S.)	44	28/8/47
Forster, N. L., Abington, Armidale (Aberdeen-Angus)	167	24/5/48
Frater, A. D., King's Plain Road, Inverell (Guernseys)	107	11/4/47
Freudenstein, W. G. A. & F. J., "Chippendale," Grenfell Road, Young (Beef Shorthorns)	49	15/1/47
Hann, O., Bomerah, Barrington	55	8/8/47
Hawkesbury Agricultural College, Richmond (Jerseys)	119	19/3/47
Hurlstone Agricultural High School, Glenfield (Ayrcshires)	53	12/8/48
Kahlua Pastoral Co., "Kahlua," Coolac (Aberdeen-Angus)	257	30/11/47
Killen, E. L. "Pine Park," Mumbil (Beef Shorthorns)	261	25/9/46
Knight, G., Tannabah, Coonabarabran ...	60	30/11/46
Lidcombe State Hospital and Home (Friesian)	98	10/10/48
Limond Bros., Morisset (Ayrshires)	64	26/4/47
McGarvie Smith Animal Husbandry Farm, Liverpool (Jerseys)	72	22/2/47
Martin, W. W., "Narooma," Urana Road, Wagga (Jerseys)	127	14/9/48
Navua Stud Farm, Grose Wold, via Richmond (Jerseys)	120	8/10/47
New England Experiment Farm, Glen Innes (Jerseys)	46	18/3/47
Newman, G. H., "Bunnigalore," Belanglo (Jerseys)	38	2/12/46
Peel River Land and Mineral Co., Tamworth (Poll Shorthorns)	110	16/10/46
Raper, W. R., Calool, Culcairn (Beef Shorthorns)	86	12/2/47
Reid, D. B., "Evandale," Sutton Forest (Aberdeen-Angus)	61	23/11/47
Riverina Welfare Farm, Yanco (Jerseys) ...	113	16/8/47
Scott, A. W., "Milong," Young (Aberdeen-Angus)	114	11/6/46
Simpson, F. S., "Gunnawarra," Gulargambone (Beef Shorthorns)	167	19/11/47
Trangie Experiment Farm, Trangie (Aberdeen-Angus)	155	11/3/47
Wagga Experiment Farm (Jerseys)	15	1/2/47
Wallaga Lake Aboriginal Station	19	29/4/47
White, H. F. Bald Blair, Guyra (Aberdeen-Angus	300	20/4/47
Wollongbar Experiment Farm (Guernseys) ...	110	16/3/47
Young, A., "Daylesford," Cudal (Beef Shorthorns)	83	25/2/47

Owner and Address.	Number Tested.	Expiry Date.
Herds Other than Registered Stud Herds.		
114 A.G.H., Kenmore	48	26/5/46
Aboriginal Station, Brewarrina	14	26/5/46
Aboriginal Station, Wallaga Lake	19	29/4/47
Australian Missionary College, Cooranbong ...	100	30/8/47
Barnardo Farm School, Mowbray Park ...	53	18/7/47
Brookfield Afforestation Camp, Mannus ...	197	12/7/47
Cameron, N., Montrose, Armidale (late New England Girls School)	33	20/2/47
De Fraine, A. N., Reservoir Hill, Inverell ...	21	8/6/47
Department of Education, Gosford Farm Home	37	26/2/47
Ehsman Bros., Inverell	39	29/8/48
Emu Plains Prison Farm	115	29/1/47
Fairbridge Farm School, Molong	25	9/7/47
Forster, N.L., and Sons, "Abington," Armidale	62	24/5/48
Foy, F. J., The Valley Farm, Megalong Valley	25	18/12/47
Frizelle, W. J., Rosenstein Dairy, Inverell ...	134	16/8/47
Goulburn District Hospital	3	7/11/47
Goulburn Reformatory, Goulburn	7	27/6/47
Grant, W. S., "Monkittee," Braidwood ...	23	29/4/47
Hannaford, A., Braidwood	10	1/2/47
Harcombe, F. C., Hillcrest Farm, Warialda Road, Inverell	53	10/4/47
Hunt, F. W., Spencers Gully	27	16/2/47
Koyong School, Moss Vale	2	5/3/47
Lott, J. H., "Bellevue," Rob Roy, Inverell...	41	26/6/47
Lunacy Department, Callan Park Mental Hospital	43	4/4/47
Lunacy Department, Gladesville Mental Hospital	20	15/4/46
Lunacy Department, Morisset Mental Hospital	79	8/3/47
Lunacy Department, Parramatta Mental Hospital	62	26/7/47
Lunacy Department, Rydalmere Mental Hospital	57	30/10/46
McGufficke, J. O., "Lovely Bank," Rob Roy, Inverell	33	25/6/47
McLane, R. G. P., Ibis Valley, Swanbrook ...	24	23/5/47
Morris, S. W., "Dunreath," Swanbrook Rd., Inverell	51	23/5/48
Murray, J. A., "The Willows," Keiraville ...	21	8/8/46
New England University College, Armidale ...	19	1/5/47
Orange Mental Hospital	63	19/3/47
Parker Bros., Hampton Court Dairy, Inverell	125	25/8/47
Peat and Milson Islands Mental Hospital ...	24	2/9/47
Reid, G. T., "Narrengullen," Yass	275	15/7/48
Richardson, C. E. D., Kayuga Road, Muswellbrook	78	2/7/47
Rolfe, V. J., "Mount View," Inverell ...	18	9/2/47
St. Ignatius' College, Riverview	24	7/7/47
St. John's College, Armidale	11	20/2/47
St. Joseph's Orphanage, Kendall Grange, Lake Macquarie	9	11/6/47
St. Michael's Orphanage, Baulkham Hills ...	40	4/6/47
St. Patrick's Orphanage, Armidale	10	15/11/46
St. Vincent's Boys' Home, Westmead ...	33	9/7/48
State Penitentiary, Long Bay	13	30/11/47
Stephenson, W. J., "Hill View," Fig Tree ...	53	1/2/47
The Sydney Church of England Grammar School, Moss Vale	48	18/12/47
Turnbull, J. M., "Pastime," Kayuga Road, Muswellbrook	85	20/3/47
Weidman, A. B., No. 2 Dairy, Aberdeen Road, Muswellbrook	87	8/10/47
Weidman, A. B., No. 3 Dairy, Kayuga Road, Muswellbrook	94	8/10/47
Weidman, A. B., No. 4 Dairy, Kayuga Road, Muswellbrook	66	8/10/48
William Thompson Masonic School, Baulkham Hills	54	10/6/47
Wilson, A. G., "Blytheswood," Exeter ...	66	23/4/47
Wilton, C., Bligh Street, Muswellbrook ...	54	12/5/46
Youth Welfare Association of Australia ...	262	26/4/47

Tubercle-free Herds—*continued.*

Tubercle-free Areas.

THE following Areas have been declared tubercle-free and no cattle are allowed to be kept therein unless subjected to the tuberculin test and found free from tuberculosis:—

Bombala Area.
Inverell Area.
Braidwood Area.
Municipality of Muswellbrook.
Municipality of Queanbeyan.

MAX HENRY, Chief Division of Animal Industry.

Small Oat Harvest Forecast for New South Wales.

THE oat harvest this season is expected to be very light. The forecast made by the Division of Marketing and Agricultural Economics of the Department of Agriculture estimates total yield of oat grain at 1,900,000 bushels and oaten hay at not more than 100,000 tons. This will be considerably below last year's total of 9,997,000 bushels of grain and 353,000 tons of oaten hay.

Production for districts in which oats are grown is estimated as follows:—

	GRAIN.		HAY.	
Coastal....	40,000	bushels	8,000	tons
Northern..	120,000	„	7,000	„
Central ..	355,000	„	15,000	„
Southern..	1,385,000	„	70,000	„
	1,900,000	„	100,000	„

Commenting on this forecast Dr. H. J. Hynes, Chief of the Division of Marketing and Agricultural Economics, said that, in common with wheat, oat crops this season had suffered severely from drought conditions over the greater part of the cereal growing districts.

Adverse seasonal conditions in the north and north-west prevented the sowing of many areas, whilst in other districts wheat was sown in preference to oats because of the comparatively high price being offered for wheat grain.

In western districts early plantings made a good start, but lack of rain and shortage of fodder were the causes of most areas being utilised as feed for stock.

The southernmost portions of the State experienced the most favourable sowing conditions and prospects were very good in August. Abnormally dry weather during the next two months caused a considerable deterioration, and reports now indicate that only in favoured areas are satisfactory returns anticipated. These areas include parts of the Southern Riverina, Southern Tableland, and the southern portion of the Central Tableland Divisions, also irrigated areas around Deniliquin, Finley, Berrigan and in the Jemalong Shire.

Grasshoppers are reported to have hatched in plague proportions in Berrigan-Deniliquin area and in Narromine-Parkes-Forbes localities, and may be a contributing factor to a reduced return.

Japanese Millet is an Ideal Crop for Quick Spring and Summer Grazing.

WITH conditions now generally favourable for sowing, no time should be lost in making provision for stock feed. Japanese millet is the ideal crop to grow in spring and summer to provide grazing quickly for all classes of stock, particularly at such a time as the present, following a prolonged period of drought. This applies equally to inland and coastal areas.

Japanese millet gives good bulk, is of high feeding value, particularly for milk production, has no dangerous properties, recovers well after grazing, and makes a coarse but very valuable hay. It has proved to be the ideal pioneering crop in inland irrigation areas to provide feed prior to establishing improved pastures.

Because of its high milk-producing qualities, which are stated to be equal to those of lucerne, it should enter regularly into the cropping and feeding programme on coastal dairy farms.

Full information on the production of fodder millet is given in a pamphlet obtainable free on application to the Division of Information and Extension Services, Department of Agriculture, Box 36A, G.P.O., Sydney.

Brucellosis-free Herd Scheme (Swine).

THE following is a list of the names and addresses of owners of herds which have been declared brucellosis-free in accordance with the requirements of the Brucellosis-free Herd Scheme (Swine). The work in connection with this scheme has been undertaken as part of the general campaign against this disease and should perform a valuable service to the industry generally. Owing to the limitations of staff it will not be possible for the Department to undertake the testing of herds in general for this purpose, and in future only herds belonging to Government institutions, registered stud herds, or those containing a preponderance of registered stud animals, will be accepted for inclusion in the list. A charge will be made for the work, since the inclusion of a herd in this list should be of benefit to the owner. After a herd has been accredited, two semi-annual tests will be required, and thereafter annual tests, provided that the conditions outlined in the agreement form are strictly adhered to and that negative results are obtained at each test. So far as the elimination of the disease is concerned, apart from placing the herd on the accredited list, this work will continue as at present.

Registered Stud Herds.

Bathurst Experiment Farm, Bathurst.
Boardman, C. M., "Fairview," Camden.
Campbell, D., "Hillangrove," Wamberal, via Gosford
Cocks, F. D., "Condalarra," Miranda.
Cowra Experiment Farm, Cowra.
Croft, F., Lugwardine, Kentucky.
Draper, R. E., "Glengar," Capertee.
Foley, J. B., Gundurimba Road, Loftville, via Lismore
Garrison Battalion (2nd), [illegible].
[illegible] Mental Hospital.
Government Agricultural Training Farm, Scheyville.
Grafton Experiment Farm, Grafton.
Harris, K. H., Pennant Stud Piggery, Purchase Road, West Pennant Hills.
Hawkesbury Agricultural College, Richmond.
Holland, A. L., Argonne, Tubbul.
Hurlstone Agricultural High School, Glenfield.
New England Experiment Farm, Glen Innes.
Newington State Hospital and Home, Newington.
Ricketts, C. C., "Mangus," Young.
Riverina Welfare Farm, Yanco.
Rydalmere Mental Hospital.
Shirley, G. F., "Camelot," Penrith.
Upston, H. E., Wattle Tree Road, Holgate, via Gosford.
Wagga Experiment Farm, Wagga.
Waterfall Sanatorium, Waterfall.
White, A. N., Blakeney Stud, Orange.
Williams, G. R. B., "Gwandalan," Grenfell.
Wollongbar Experiment Farm, Wollongbar.
Yanco Agricultural High School.

Herds Other than Registered Stud Herds.

114 A.G.H., Kenmore.
Bathurst Gaol, Bathurst.
Brookfield Afforestation Camp, Mannus
Callan Park Mental Hospital, Callan Park, Rozelle.
Emu Plains Prison Farm.
Glen Innes Prison Camp, Glen Innes.
Gosford Farm Home for Boys, Gosford.
Goulburn Reformatory, Goulburn.
Higgins, J. P., "Koranga," Camden.
Lidcombe State Hospital.
Morisset Mental Hospital, Morisset.
Orange Mental Hospital.
Parramatta Gaol, Parramatta.
Parramatta Mental Hospital.
Peat and Milson Islands Mental Hospital, Hawkesbury River.
Stockton Mental Hospital.

Abortion-free Herds.

THE following herds have been declared free of contagious abortion (Bang's disease) in accordance with the requirements of the scheme of certifying herds abortion-free :—

Owner and Address	Number in herd.
Registered Stud Herds.	
Armstrong, K. A., "Heathfield," Boorowa	23
Bathurst Experiment Farm (Guernseys)	28
Cowra Experiment Farm (Ayrshires)	55
Department of Education—Farm Home for Boys, Mittagong (A.I.S.)	51
Dixson, R. C., "Elwatan," Castle Hill (Jerseys)	22
Fairbairn & Co., C. P., Woomargama (Beef Shorthorns)	173
Farrer Memorial Agricultural High School, Nemingha (A.I.S.)	44
Forster, N. L., Abington, Armidale (Aberdeen-Angus)	167
Hann, O., "Bomerah," Barrington (Jerseys)	[illegible]
Hawkesbury Agricultural College, [illegible]	[illegible]
Hicks Bros., "[illegible]," [illegible]	65
Hill, E. Pritchard, [illegible] (Jerseys)	96
Hurlstone Agricultural High School, Glenfield (Ayrshires)	53
Killen, E. L., Pine Park, Mumbil	141
McEachern, H., Tarcutta (Red Poll)	61
McSweeney, W. J., "The Rivers," Canowindra (Beef Shorthorns)	95
Martin Bros., "Narooma," Urana-road, Wagga (Jerseys)	127
Navua Stud Farm, Grose Wold, via Richmond (Jerseys)	101
New England Experiment Farm, Glen Innes (Jerseys)	46
Peel River Land & Mineral Co., Tamworth (Beef Shorthorns)	100
Raper, F. S., Calool, Culcairn	80
Reid, G. T., "Narengullen," Yass (Aberdeen-Angus)	276
Riverina Welfare Farm, Yanco	235
Robertson, S. H., "Turanville," Scone	90
Scott, A. W., "Milong," Young (Aberdeen-Angus)	474
Simpson, F. S., "Gunnawarra," [illegible] (Beef Shorthorns)	150
Training Farm, Berry	118
Trangie Experiment Farm, Trangie (Aberdeen-Angus)	155
Wagga Experiment Farm, Wagga (Jerseys)	47
Walker, Jas. R., "Strathdoon," Wolseley Park (Red Polls)	37
White, F. J., and Sons, Bald Blair, Guyra (Aberdeen-Angus)	152
Whitelaw, L. A., "Wendouree," Merriwa (Beef Shorthorns)	79
Wollongbar Experiment Farm (Guernseys)	110
Young, K., "Rockiynne," Cudal (Polled Beef Shorthorns)	27
Herds Other than Registered Stud Herds.	
114 A.G.H., Kenmore	49
Callan Park Mental Hospital	45
Department of Education—Farm Home for Boys, Gosford	84
Fairbridge Farm School, Molong	[illegible]
Forster, N. L., and Sons, "Abington," Armidale	62
Morisset Mental Hospital	66
New England University College, Armidale	20
Orange Mental Hospital	61
Peat & Milson Islands Mental Hospital	24
Royal Prince Alfred Hospital, Camperdown, "Yaralla" Herd	94
Rydalmere Mental Hospital, Rydalmere	57
Salway, A. E., Cobargo	62

MAX HENRY, Chief of Division of Animal Industry.